CISCO SYSTEMS

Cisco MGX 8850 (PXM1E/PXM45), Cisco MGX 8950, Cisco MGX 8830, and Cisco MGX 8880 Configuration Guide

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About This Guide

This preface describes the objectives, audience, organization, and conventions of the *Cisco MGX 8850 (PXM1E/PXM45), Cisco MGX 8950, Cisco MGX 8830, and Cisco MGX 8880 Configuration Guide*.

Objectives

This guide describes how to configure the Cisco MGX 8830, Cisco MGX 8850 (PXM1E/PXM45), and Cisco MGX 8950 switches and the Cisco MGX 8880 Media Gateway. This guide also describes how to perform some operating procedures after the switch begins operation.

Audience

The *Cisco MGX 8850 (PXM1E/PXM45), Cisco MGX 8950, Cisco MGX 8830, and Cisco MGX 8880 Configuration Guide* provides network operators and administrators with configuration procedures for setting up Cisco MGX 8830, Cisco MGX 8850 (PXM1E/PXM45), and Cisco MGX 8950 switches and the Cisco MGX 8880 Media Gateway.

Organization

The major sections of this document are as follows:

- Chapter 1, “Preparing for Configuration,” describes information you will need during configuration and provides planning guidelines for configuration.
- Chapter 2, “Configuring General Switch Features,” describes how to configure features that apply to the entire switch, rather than to a single card, line, or trunk.
- Chapter 3, “Provisioning PXM1E Communication Links,” describes how to configure PXM1E lines and provision connections on those lines.
- Chapter 4, “Preparing Service Modules for Communication,” describes how to initialize service modules in preparation for provisioning.
- Chapter 5, “Preparing SRM Cards for Communications,” describes how to configure the PXM to use the bulk distribution feature provided by SRM cards.
- Chapter 6, “Preparing RPM Cards for Operation,” describes how to initialize RPM-PR and RPM-XF cards in the switch, determine the software versions in use, and configure 1:N card redundancy.

- Chapter 7, “Managing Service Class Templates,” describes how to download and use service class templates for AXSM, PXM1E, and FRSM12 cards.
- Chapter 8, “Managing PNNI Nodes and PNNI Routing,” provides information you can use to optimize PNNI routing.
- Chapter 9, “Switch Operating Procedures,” describes how to manage your configuration after the switch is configured and during day-to-day operation.
- Chapter 10, “Switch Maintenance Procedures,” provides procedures for adding and replacing cards after the initial installation and configuration of the switch.
- Chapter 11, “Viewing and Responding to Alarms,” describes the controls available on the switch and how to view switch alarms.
- Appendix A, “Downloading and Installing Software Upgrades,” explains how to upgrade switch software.
- Appendix B, “PXM Backup Boot Procedures,” describes special procedures you can use to manage the switch when only the boot software is loaded.
- Appendix C, “Supporting and Using Additional CLI Access Options,”describes alternative ways to connect management workstations to the switch.
- Appendix D, “Standards Compliance,” describes the technical and compliance specifications for Release 4 of the Cisco MGX switches and the Cisco MGX 8880 Media Gateway.
- Appendix E, “Hardware Survey and Software Configuration Worksheets,” provides worksheets that you can use to plan for or record the configuration of Cisco MGX switches and the Cisco MGX 8880 Media Gateway.

Conventions

This publication uses the conventions listed in the following paragraphs.

Command descriptions use these conventions:

- Commands and keywords are in **boldface**.
- Arguments for which you supply values are in *italics*.
- Required command arguments are inside angle brackets (< >).
- Optional command arguments are in square brackets ([ ]).
- Alternative keywords are separated by vertical bars (|).

Examples use these conventions:

- Terminal sessions and information the system displays are in `screen` font.
- Information you enter is in **`boldface screen`** font.
- Nonprinting characters, such as passwords, are in angle brackets (< >).
- Default responses to system prompts are in square brackets ([ ]).

Note Means *reader take note*. Notes contain helpful suggestions or references to material not covered in the manual.

Caution Means *reader be careful*. In this situation, you might do something that could result in equipment damage or loss of data.

Tips Means *the following information will help you solve a problem*. The tips information might not be troubleshooting or even an action, but could be useful information, similar to a Timesaver.

Warning **This warning symbol means *danger*. You are in a situation that could cause bodily injury. Before you work on any equipment, you must be aware of the hazards involved with electrical circuitry and be familiar with standard practices for preventing accidents. (To see translated versions of this warning, refer to the *Regulatory Compliance and Safety Information* document that accompanied the product.)**

Documentation

A *Guide to Cisco Multiservice Switch and Media Gateway Documentation* ships with your product. That guide contains general information about how to locate Cisco MGX, BPX, SES, and CWM documentation online.

Documentation Notes for the April 2004 Product Releases

The April 2004 release includes new hardware or features for the following releases:

- Cisco MGX Release 5 for the MGX 8880 Media Gateway
- Cisco MGX Release 5 for these multiservice switches:
  - Cisco MGX 8850 (PXM1E)
  - Cisco MGX 8850 (PXM45)
  - Cisco MGX 8950
  - Cisco MGX 8830
- Cisco MGX Release 1.3, for these multiservice switches:
  - Cisco MGX 8850 (PXM1)
  - Cisco MGX 8230
  - Cisco MGX 8250
- Cisco VXSM Release 5. The Voice Switch Service Module (VXSM) card is new for this release.
- Cisco WAN Manager Release 15. The Cisco WAN Manager (CWM) network management software is improved for this release. The previous release of CWM was 12. CWM Release 15 introduces a helpful new documentation feature: web-based *online Help*. To invoke online Help, press **F1** on a PC, press the **Help** key on a UNIX workstation, or select **Help** from the main or popup menu.

Other components of multiservice WAN products, such as the Service Expansion Shelf (SES) and WAN switching software have no new features for the April 2004 release, therefore, their existing documentation was not updated.

Related Documentation

This section describes the technical manuals and release notes that support the April 2004 release of Cisco Multiservice Switch products.

Technical Manual Order of Use

Use the technical manuals listed here in the following order:

Step 1 Refer to the documents that ship with your product. Observe all safety precautions.

- *Regulatory Compliance and Safety Information for Cisco Multiservice Switch and Media Gateway Products (MGX, BPX, and SES)*—This document familiarizes you with safety precautions for your product.
- *Guide to Cisco Multiservice Switch and Media Gateway Documentation*—This document explains how to find documentation for MGX, BPX, and SES multiservice switches and media gateways as well as CWM network management software. These documents are available only online.
- *Installation Warning Card*—This document provides precautions about installing your cards. It explains such subjects as removing the shipping tab and inserting cards properly into the correct slots.

Step 2 Refer to the release notes for your product.

Step 3 If your network uses the CWM network management system, upgrade CWM. (If you are going to install CWM for the first time, do so *after* Step 4.) Upgrade instructions are included in the following documents:

- *Cisco WAN Manager Installation Guide, Release 15*
- *Cisco WAN Manager User's Guide, Release 15*

Step 4 If your network contains MGX and SES products, refer to this manual for planning information:

- *Cisco PNNI Network Planning Guide for MGX and SES Products*

Step 5 Refer to these manuals for information about installing cards and cables in the MGX chassis:

- *Cisco MGX 8850 (PXM1E/PXM45), Cisco MGX 8950, Cisco MGX 8830, and Cisco MGX 8880 Hardware Installation Guide, Releases 2 Through 5* for installing cards and cables in these chassis.
- *Cisco MGX 8xxx Edge Concentrator Installation and Configuration Guide* for installing cards and cables in the Cisco MGX 8230, Cisco MGX 8250, or Cisco MGX 8850 (PXM1) chassis.

Step 6 Refer to the manuals that help you configure your MGX switch and processor cards:

- *Cisco MGX 8850 (PXM1E/PXM45), Cisco MGX 8950, Cisco MGX 8830, and Cisco MGX 8880 Configuration Guide, Release 5* for these chassis.
- *Cisco MGX 8xxx Edge Concentrator Installation and Configuration Guide* for the Cisco MGX 8230, Cisco MGX 8250, or Cisco MGX 8850 (PXM1) chassis.

Step 7 Refer to the manual that supports the additional cards you intend to install in your switch. For example:

- The services books can help you establish ATM, Frame Relay, or circuit emulation services on your switch.
- The VISM book can help you set up your switch as a voice gateway, and the RPM book can help you implement IP on the switch.

Step 8 Additional books, such as command reference guides and error message books, can help with the daily operation and maintenance of your switch.

Note Manual titles may be different for earlier software releases. The titles shown in Table 1 are for the April 2004 release.

Technical Manual Titles and Descriptions

Table 1 lists the technical manuals and release notes that support the April 2004 multiservice switch product releases. Books and release notes in Table 1 are listed in order of use and include information about which multiservice switch or media gateway the document supports.

The books for Cisco MGX 8230, Cisco MGX 8250, and Cisco MGX 8850 (PXM1) switches were not updated for the April 2004 release, therefore, some information about configuring and using the new MPSM-8-T1E1 card in these switches is included in the following books:

- *Cisco ATM Services (AUSM/MPSM) Configuration Guide and Command Reference for MGX Switches, Release 5*
- *Cisco Frame Relay Services (FRSM/MPSM) Configuration Guide and Command Reference for MGX Switches, Release 5*
- *Cisco Circuit Emulation Services (CESM/MPSM) Configuration Guide and Command Reference for MGX Switches, Release 5*

Information about how to install or upgrade to the MPSM-8-T1E1 card in Cisco MGX 8230, Cisco MGX 8250, and Cisco MGX 8850 (PXM1) switches is in the *Release Notes for Cisco MGX 8230, Cisco MGX 8250, and Cisco MGX 8850 (PXM1) Switches, Release 1.3.00*.

Note Refer to each product's release notes for the latest information on features, bug fixes, and more.

Terms

Two main types of ATM cards are used in MGX switches: AXSM and AUSM. *AXSM* stands for ATM Switching Service Module. *AUSM* stands for ATM UNI (User Network Interface) Service Module.

CWM stands for Cisco WAN Manager, our multiservice switch network management system.

Legacy service module refers to a previously introduced card. For this release, the term is used specifically for the CESM-8-T1E1, FRSM-8-T1E1, and AUSM-8-T1E1 cards, which can now be replaced by the new MPSM-8-T1E1 card.

MPSM stands for Multiprotocol Service Module.

RPM stands for Route Processor Module.

SES stands for Service Expansion Shelf.

VISM stands for Voice Interworking Service Module.

VXSM stands for Voice Switch Service Module.

Table 1 Technical Manuals and Release Notes for Cisco MGX and BPX Switches and Media Gateways (April 2004 Product Releases)

Document Title and Part Number	BPX with SES Rel. 4	MGX 8230 Rel. 1.3	MGX 8250 Rel. 1.3	MGX 8850 (PXM1) Rel. 1.3	MGX 8830 Rel. 5	MGX 8850 (PXM1E) Rel. 5	MGX 8850 (PXM45) Rel. 5	MGX 8950 Rel. 5	MGX 8880 Rel. 5.
Overview and Safety Documents									
Guide to Cisco Multiservice Switch and Media Gateway Documentation DOC-7814807=	x	x	x	x	x	x	x	x	x
Installation Warning Card DOC-7812348=	x	x	x	x	x	x	x	x	x
Regulatory Compliance and Safety Information for Cisco Multiservice Switch and Media Gateway Products (MGX, BPX, and SES) DOC-7814790=	—	x	x	x	x	x	x	x	x
Release Notes for the Cisco MGX 8880 Media Gateway, Release 5.0.00 OL-5190-01	—	—	—	—	—	—	—	—	x
Release Notes for Cisco MGX 8850 (PXM1E/PXM45), Cisco MGX 8950, and Cisco MGX 8830 Switches, Release 5.0.00 OL-4538-01	—	—	—	—	x	x	x	x	
Release Notes for Cisco MGX 8230, Cisco MGX 8250, and Cisco MGX 8850 (PXM1) Switches, Release 1.3.00 OL-4539-01	—	x	x	x	—	—	—	—	—
Release Notes for the Cisco Voice Switch Service Module (VXSM), Release 5.0.00 OL-4627-01	—	—	—	—	—	—	x	—	x
Release Notes for Cisco WAN Manager, Release 15.0.00 OL-4151-01	—	—	—	—	x	x	x	x	x
Release Notes for the Cisco Voice Interworking Service Module (VISM), Release 3.2.10 *OL-4544-01*	—	x	x	x	x	x	x	—	x

Table 1 Technical Manuals and Release Notes for Cisco MGX and BPX Switches and Media Gateways (April 2004 Product Releases) (continued)

Document Title and Part Number	BPX with SES Rel. 4	MGX 8230 Rel. 1.3	MGX 8250 Rel. 1.3	MGX 8850 (PXM1) Rel. 1.3	MGX 8830 Rel. 5	MGX 8850 (PXM1E) Rel. 5	MGX 8850 (PXM45) Rel. 5	MGX 8950 Rel. 5	MGX 8880 Rel. 5.
Release Notes for Cisco MGX Route Processor Module (RPM-XF) IOS Release 12.3(2)T5 for PXM45-based Switches, Release 5.0.00 OL-4536-01	—	—	—	—	—	—	x	x	x
Release Notes for Cisco MGX Route Processor Module (RPM-PR) IOS Release 12.3(2)T5 for MGX Releases 1.3.00 and 5.0.00 OL-4535-1	—	x	x	x	x	x	x	x	x
Cisco MGX 8230 Edge Concentrator Overview, Release 1.1.3[1] DOC-7812899=	—	x	—	—	—	—	—	—	—
Cisco MGX 8250 Edge Concentrator Overview, Release 1.1.3[1] DOC-7811576=	—	—	x	—	—	—	—	—	—
Cisco MGX 8850 Multiservice Switch Overview, Release 1.1.3[1] OL-1154-01	—	—	—	x	—	—	—	—	—
Hardware Installation Guides									
Cisco MGX 8850 (PXM1E/PXM45), Cisco MGX 8950, Cisco MGX 8830, and Cisco MGX 8880 Hardware Installation Guide, Releases 2 Through 5 OL-4545-01	—	—	—	—	x	x	x	x	x
Cisco Service Expansion Shelf Hardware Installation Guide, Release 1[1] DOC-786122=	x	—	—	—	—	—	—	—	—
Planning and Configuration Guides									
Cisco PNNI Network Planning Guide for MGX and SES Products OL-3847-01	x	—	—	—	x	x	x	x	x

Table 1 Technical Manuals and Release Notes for Cisco MGX and BPX Switches and Media Gateways (April 2004 Product Releases) (continued)

Document Title and Part Number	BPX with SES Rel. 4	MGX 8230 Rel. 1.3	MGX 8250 Rel. 1.3	MGX 8850 (PXM1) Rel. 1.3	MGX 8830 Rel. 5	MGX 8850 (PXM1E) Rel. 5	MGX 8850 (PXM45) Rel. 5	MGX 8950 Rel. 5	MGX 8880 Rel. 5.
Cisco MGX 8850 (PXM1E/PXM45), Cisco MGX 8950, Cisco MGX 8830, and Cisco MGX 8880 Configuration Guide, Release 5 OL-4546-01	—	—	—	—	x	x	x	x	x
Cisco WAN Manager Installation Guide, Release 15 OL-4550-01	—	—	—	—	x	x	x	x	x
Cisco WAN Manager User's Guide, Release 15 OL-4552-01	—	—	—	—	x	x	x	x	x
Cisco MGX 8850 Edge Concentrator Installation and Configuration, Release 1.1.3[1] DOC-7811223=	—	—	—	x	—	—	—	—	—
Cisco SES PNNI Controller Software Configuration Guide, Release 3[1] DOC-7814258=	x	—	—	—	—	—	—	—	—
Cisco MGX 8230 Edge Concentrator Installation and Configuration, Release 1.1.3[1] DOC-7811215=	—	x	—	—	—	—	—	—	—
Cisco MGX 8250 Edge Concentrator Installation and Configuration, Release 1.1.3[1] DOC-7811217=	—	—	x	—	—	—	—	—	—
Service Module Configuration and Reference Guides									
Cisco MGX Route Processor Module (RPM-PR) Installation and Configuration Guide, Release 2.1 78-12510-02	—	x	x	x	—	—	—	—	—
Cisco Frame Relay Software Configuration Guide and Command Reference for the Cisco MGX 8850 (PXM45) FRSM-12-T3E3 Card, Release 3[1] DOC-7810327=	—	—	—	—	—	—	x	—	—

Table 1 Technical Manuals and Release Notes for Cisco MGX and BPX Switches and Media Gateways (April 2004 Product Releases) (continued)

Document Title and Part Number	BPX with SES Rel. 4	MGX 8230 Rel. 1.3	MGX 8250 Rel. 1.3	MGX 8850 (PXM1) Rel. 1.3	MGX 8830 Rel. 5	MGX 8850 (PXM1E) Rel. 5	MGX 8850 (PXM45) Rel. 5	MGX 8950 Rel. 5	MGX 8880 Rel. 5.
Cisco ATM Services (AUSM/MPSM) Configuration Guide and Command Reference for MGX Switches, Release 5[2] OL-4540-01	—	[2]	[2]	[2]	x	x	—	—	—
Cisco Frame Relay Services (FRSM/MPSM) Configuration Guide and Command Reference for MGX Switches, Release 5[2] *OL-4541-01*	—	[2]	[2]	[2]	x	x	x	—	—
Cisco Circuit Emulation Services (CESM/MPSM) Configuration Guide and Command Reference for MGX Switches, Release 5[2] OL-0453-01	—	[2]	[2]	[2]	x	x	x	—	—
Cisco MGX Route Processor Module (RPM-XF) Installation and Configuration Guide, Release 4[1] OL-5087-01	—	—	—	—	—	—	x	x	—
Cisco ATM Services (AXSM) Configuration Guide and Command Reference for MGX Switches, Release 5 OL-4548-01	—	—	—	—	—	—	x	x	x
Cisco ATM and Frame Relay Services (MPSM-T3E3-155) Configuration Guide and Command Reference for MGX Switches, Release 5 OL-4554-01	—	—	—	—	x	x	x	—	—
Cisco Voice Switch Services (VXSM) Configuration Guide and Command Reference for MGX Switches and Media Gateways, Release 5 OL-4625-01	—	—	—	—	—	—	x	—	x
Cisco Voice Interworking Services (VISM) Configuration Guide and Command Reference, Release 3.2[1] OL-4359-01	—	x	x	x	x	x	x	—	x

Table 1 Technical Manuals and Release Notes for Cisco MGX and BPX Switches and Media Gateways (April 2004 Product Releases) (continued)

Document Title and Part Number	BPX with SES Rel. 4	MGX 8230 Rel. 1.3	MGX 8250 Rel. 1.3	MGX 8850 (PXM1) Rel. 1.3	MGX 8830 Rel. 5	MGX 8850 (PXM1E) Rel. 5	MGX 8850 (PXM45) Rel. 5	MGX 8950 Rel. 5	MGX 8880 Rel. 5.
Reference Guides									
Cisco MGX 8230 Multiservice Gateway Error Messages, Release 1.1.3[1] DOC-78112113=	—	x	—	—	—	—	—	—	—
Cisco MGX 8230 Multiservice Gateway Command Reference, Release 1.1.3[1] DOC-7811211=	—	x	—	—	—	—	—	—	—
Cisco MGX 8250 Multiservice Gateway Command Reference, Release 1.1.3[1] DOC-7811212=	—	—	x	—	—	—	—	—	—
Cisco MGX 8250 Multiservice Gateway Error Messages, Release 1.1.3[1] DOC-7811216=	—	—	x	—	—	—	—	—	—
Cisco MGX 8800 Series Switch Command Reference, Release 1.1.3[1] DOC-7811210=	—	x	x	x	—	—	—	—	—
Cisco MGX 8800 Series Switch System Error Messages, Release 1.1.3[1] DOC-7811240=	—	x	x	x	—	—	—	—	—
Cisco SES PNNI Controller Command Reference, Release 3[1] DOC-7814260=	x	—	—	—	—	—	—	—	—
Cisco MGX 8850 (PXM45/PXM1E), Cisco MGX 8950, Cisco MGX 8830, and Cisco MGX 8880 Command Reference, Release 5 OL-4547-01	—	—	—	—	x	x	x	x	x
Cisco WAN Manager SNMP Service Agent, Release 15 OL-4551-01	—	—	—	—	x	x	x	x	x

Table 1 Technical Manuals and Release Notes for Cisco MGX and BPX Switches and Media Gateways (April 2004 Product Releases) (continued)

Document Title and Part Number	BPX with SES Rel. 4	MGX 8230 Rel. 1.3	MGX 8250 Rel. 1.3	MGX 8850 (PXM1) Rel. 1.3	MGX 8830 Rel. 5	MGX 8850 (PXM1E) Rel. 5	MGX 8850 (PXM45) Rel. 5	MGX 8950 Rel. 5	MGX 8880 Rel. 5.
Cisco WAN Manager Database Interface Guide, Release 15 OL-4587-01	—	—	—	—	x	x	x	x	x
Cisco MGX and Service Expansion Shelf Error Messages, Release 5 OL-4553-01	x	—	—	—	x	x	x	x	x

1. This document was not updated for the April 2004 release.
2. Some configuration and command information is included in this book for using the multiprotocol service module (MPSM-8-T1E1) in a Cisco MGX 8230, MGX 8250, or MGX 8850 (PXM1) switch.

Note For the April 2004 product release, there are no new features for the Service Expansion Shelf (SES) of the BPX switch and BPX WAN switching software. Therefore, documentation for these items was not updated. Table 1 lists the most recent technical manuals and release notes for these products.

Table 1 also lists the latest documentation available for the Cisco MGX 8230, Cisco MGX 8250, and Cisco MGX 8850 (PXM1) switches. These switches use the PXM1 processor card. Although there are new features in MGX Release 1.3 for these switches, only the release notes were updated. And the following books contain some information about configuring the MPSM-8-T1E1 card for use in these switches:

- *Cisco Circuit Emulation Services (CESM/MPSM) Configuration Guide and Command Reference for MGX Switches, Release 5*
- *Cisco Frame Relay Services (FRSM/MPSM) Configuration Guide and Command Reference for MGX Switches, Release 5*
- *Cisco ATM Services (AUSM/MPSM) Configuration Guide and Command Reference for MGX Switches, Release 5*

Table 2 lists the documents that ship with product.

Table 3 contains alphabetized titles and descriptions of all the manuals and release notes listed in Table 1.

Table 2 Documents that Ship with Multiservice Switch Products

Document Title	Description
Guide to Cisco Multiservice Switch and Media Gateway Documentation DOC-7814807=	Describes how to find the manuals and release notes that support multiservice switches and network management products. These documents are available only online. **This guide ships with product.**
Installation Warning Card DOC-7812348=	**Contains precautions that you should take before you insert a card into a slot. This Warning Card ships with product.**
Regulatory Compliance and Safety Information for Cisco Multiservice Switch and Media Gateway Products (MGX, BPX, and SES) DOC-7814790=	Provides regulatory compliance information, product warnings, and safety recommendations for all the Cisco MGX multiservice switches: MGX 8230, MGX 8250, MGX 8850 (PXM1), MGX 8850 (PXM45), MGX 8850 (PXM1E), MGX 8830 and MGX 8950. Also provides such information for the MGX 8880 Media Gateway. **This book ships with product.**

Table 3 Descriptions of Technical Manuals and Release Notes for Cisco Multiservice Switch Products

Document Title	Description
Cisco ATM and Frame Relay Services (MPSM-T3E3-155) Configuration Guide and Command Reference for MGX Switches, Release 5 OL-4554-01	Provides software configuration procedures for provisioning ATM and Frame Relay connections on the new MPSM-T3E3-155 multiprotocol service module. Also describes all MPSM-T3E3-155 commands.
Cisco ATM Services (AUSM/MPSM) Configuration Guide and Command Reference for MGX Switches, Release 5 OL-4540-01 A0	Provides software configuration procedures for provisioning connections and managing the AUSM cards supported in this release. Also describes all AUSM commands. Includes software configuration procedures for provisioning connections and managing the new MPSM-8-T1E1 card as an AUSM card replacement.
Cisco ATM Services (AXSM) Configuration Guide and Command Reference for MGX Switches, Release 5 OL-4548-01	Explains how to configure the AXSM cards and provides a command reference that describes the AXSM commands in detail. The AXSM cards covered in this manual are the AXSM-XG, AXSM/A, AXSM/B, AXSM-E, and AXSM-32-T1E1-E.
Cisco Circuit Emulation Services (CESM/MPSM) Configuration Guide and Command Reference for MGX Switches, Release 5 OL-0453-01	Provides software configuration procedures for provisioning connections and managing the Circuit Emulation Service Module (CESM) cards supported in this release. Also describes all CESM commands. Includes software configuration procedures for provisioning connections and managing the new MPSM-8-T1E1 card as a CESM card replacement.
Cisco Frame Relay Services (FRSM/MPSM) Configuration Guide and Command Reference for MGX Switches, Release 5 OL-4541-01	Provides software configuration procedures for provisioning connections and managing the Frame Relay Service Module (FRSM) cards supported in this release. Also describes all FRSM commands. Includes software configuration procedures for provisioning connections and managing the new MPSM-8-T1E1 card as an FRSM card replacement.

Table 3 Descriptions of Technical Manuals and Release Notes for Cisco Multiservice Switch Products (continued)

Document Title	Description
Cisco MGX 8230 Edge Concentrator Installation and Configuration, Release 1.1.3 DOC-7811215=	Provides installation instructions for the Cisco MGX 8230 edge concentrator.
Cisco MGX 8230 Edge Concentrator Overview, Release 1.1.3 DOC-7812899=	Describes the system components and function of the Cisco MGX 8250 edge concentrator.
Cisco MGX 8230 Multiservice Gateway Command Reference, Release 1.1.3 DOC-7811211=	Provides detailed information on the general command line interface commands.
Cisco MGX 8230 Multiservice Gateway Error Messages, Release 1.1.3 DOC-78112113=	Provides error message descriptions and recovery procedures.
Cisco MGX 8250 Edge Concentrator Installation and Configuration, Release 1.1.3 DOC-7811217=	Provides installation instructions for the Cisco MGX 8250 edge concentrator.
Cisco MGX 8250 Edge Concentrator Overview, Release 1.1.3 DOC-7811576=	Describes the system components and function of the Cisco MGX 8250 edge concentrator.
Cisco MGX 8250 Multiservice Gateway Command Reference, Release 1.1.3 DOC-7811212=	Provides detailed information on the general command line interface commands.
Cisco MGX 8250 Multiservice Gateway Error Messages, Release 1.1.3 DOC-7811216=	Provides error message descriptions and recovery procedures.
Cisco MGX 8800 Series Switch Command Reference, Release 1.1.3 DOC-7811210=	Provides detailed information on the general command line for the Cisco MGX 8850 (PXM1), Cisco MGX 8250, and Cisco MGX 8230 edge concentrators.
Cisco MGX 8800 Series Switch System Error Messages, Release 1.1.3 DOC-7811240=	Provides error message descriptions and recovery procedures for Cisco MGX 8850 (PXM1), Cisco MGX 8250, and Cisco MGX 8230 edge concentrators.

Table 3 Descriptions of Technical Manuals and Release Notes for Cisco Multiservice Switch Products (continued)

Document Title	Description
Cisco MGX 8850 (PXM1E/PXM45), Cisco MGX 8950, Cisco MGX 8830, and Cisco MGX 8880 Hardware Installation Guide, Releases 2 Through 5 OL-4545-01	Describes how to install the Cisco MGX 8950, the Cisco MGX 8850 (PXM1E/PXM45), and the Cisco MGX 8830 switches. Also describes how to install the MGX 8880 Media Gateway. This document explains what each switch does and covers site preparation, grounding, safety, card installation, and cabling. The Cisco MGX 8850 switch uses either a PXM45 or a PXM1E controller card and provides support for both serial bus-based and cell bus-based service modules. The Cisco MGX 8830 switch uses a PXM1E controller card and supports cell bus-based service modules. The Cisco MGX 8950 supports only serial bus-based service modules. The Cisco MGX 8880 uses a PXM45/C controller card, and supports only serial bus-based service modules. *This hardware installation guide replaces all previous hardware guides for these switches.*
Cisco MGX 8850 (PXM1E/PXM45), Cisco MGX 8950, Cisco MGX 8830, and Cisco MGX 8880 Configuration Guide, Release 5 OL-4546-01	Describes how to configure the Cisco MGX 8880 Media Gateway. Also describes how to configure Cisco MGX 8850 (PXM1E), Cisco MGX 8850 (PXM45), and Cisco MGX 8830 switches to operate as ATM edge switches and the Cisco MGX 8950 switch to operate as a core switch. This guide also provides some operation and maintenance procedures.
Cisco MGX 8850 (PXM45/PXM1E), Cisco MGX 8950, Cisco MGX 8830, and Cisco MGX 8880 Command Reference, Release 5 OL-4547-01	Describes the PXM commands that are available in the CLI of the Cisco MGX 8850 (PXM45), Cisco MGX 8850 (PXM1E), Cisco MGX 8950, and Cisco MGX 8830 switches. Also describes the PXM commands that are available in the CLI of the Cisco MGX 8880 Media Gateway.
Cisco MGX 8850 Edge Concentrator Installation and Configuration, Release 1.1.3 DOC-7811223=	Provides installation instructions for the Cisco MGX 8850 (PXM1) edge concentrator.
Cisco MGX 8850 Multiservice Switch Overview, Release 1.1.3 OL-1154-01	Describes the system components and function of the Cisco MGX 8850 (PXM1) edge concentrator.
Cisco MGX and Service Expansion Shelf Error Messages, Release 5 OL-4553-01	Provides error message descriptions and recovery procedures.
Cisco MGX Route Processor Module (RPM-XF) Installation and Configuration Guide, Release 4 OL-5087-01	Describes how to install and configure the Cisco MGX Route Processor Module (RPM-XF) in the Cisco MGX 8850 (PXM45) and Cisco MGX 8950 switch. Also provides site preparation procedures, troubleshooting procedures, maintenance procedures, cable and connector specifications, and basic Cisco IOS configuration information.

Table 3 Descriptions of Technical Manuals and Release Notes for Cisco Multiservice Switch Products (continued)

Document Title	Description
Cisco MGX Route Processor Module (RPM-PR) Installation and Configuration Guide, Release 2.1 78-12510-02	Describes how to install and configure the Cisco MGX Route Processor Module (RPM/B or RPM-PR) in the Cisco MGX 8850 (PXM1), the Cisco MGX 8250, and the Cisco MGX 8230 edge concentrators. Also provides site preparation procedures, troubleshooting procedures, maintenance procedures, cable and connector specifications, and basic Cisco IOS configuration information.
Cisco PNNI Network Planning Guide for MGX and SES Products OL-3847-01	Provides guidelines for planning a PNNI network that uses Cisco MGX 8830, Cisco MGX 8850 (PXM45 and PXM1E), Cisco MGX 8950, or Cisco BPX 8600 switches or the MGX 8880 Media Gateway. When connected to a PNNI network, each Cisco BPX 8600 Series switch requires an SES for PNNI route processing.
Cisco Service Expansion Shelf Hardware Installation Guide, Release 1 DOC-786122=	Provides instructions for installing and maintaining an SES controller.
Cisco SES PNNI Controller Command Reference, Release 3 DOC-7814260=	Describes the commands used to configure and operate the SES PNNI controller.
Cisco SES PNNI Controller Software Configuration Guide, Release 3 DOC-7814258=	Describes how to configure, operate, and maintain the SES PNNI controller.
Cisco Voice Interworking Services (VISM) Configuration Guide and Command Reference, Release 3.2 OL-4359-01	Describes how to install and configure the Voice Interworking Service Module (VISM) in the Cisco MGX 8830, Cisco MGX 8850 (PXM45), and Cisco MGX 8850 (PXM1E) multiservice switches. Provides site preparation procedures, troubleshooting procedures, maintenance procedures, cable and connector specifications, and Cisco CLI configuration information.
Cisco Voice Switch Services (VXSM) Configuration and Command Reference Guide for MGX Switches, Release 5 OL-4625-01	Describes the features and functions of the new Voice Switch Service Module (VXSM) in the Cisco MGX 8880 Media Gateway and in the Cisco MGX8850 (PXM45 and PXM1E) multiservice switches. Also provides configuration procedures, troubleshooting procedures, and Cisco CLI configuration information.
Cisco WAN Manager Database Interface Guide, Release 15 OL-4587-01	Provides information about accessing the CWM Informix database that is used to store information about the network elements.
Cisco WAN Manager Installation Guide, Release 15 OL-4550-01	Provides procedures for installing Release 5 of the CWM network management system.
Cisco WAN Manager SNMP Service Agent, Release 15 OL-4551-01	Provides information about the CWM Simple Network Management Protocol service agent, an optional adjunct to CWM that is used for managing Cisco WAN switches through SNMP.

Table 3 Descriptions of Technical Manuals and Release Notes for Cisco Multiservice Switch Products (continued)

Document Title	Description
Cisco WAN Manager User's Guide, Release 15 OL-4552-01	Describes how to use the CWM Release 15 software, which consists of user applications and tools for network management, connection management, network configuration, statistics collection, and security management. **Note** The CWM interface now has built-in documentation support in the form of online Help. On a PC, press **F1** to access Help; on a UNIX workstation, press the **Help** key. Alternatively, on either system you can select **Help** from the main or popup menu.
Cisco Frame Relay Software Configuration Guide and Command Reference for the Cisco MGX 8850 (PXM45) FRSM-12-T3E3 Card, Release 3 DOC-7810327=	Describes how to use the high-speed Frame Relay (FRSM-12-T3E3) commands that are available in the CLI of the Cisco MGX 8850 (PXM45) switch.
Release Notes for Cisco MGX 8230, Cisco MGX 8250, and Cisco MGX 8850 (PXM1) Switches, Release 1.3.00 OL-4539-01	Provides new feature, upgrade, and compatibility information, as well as information about known and resolved anomalies.
Release Notes for Cisco MGX 8850 (PXM1E/PXM45), Cisco MGX 8950, and Cisco MGX 8830 Switches, Release 5.0.00 OL-4538-01	Provides new feature, upgrade, and compatibility information, as well as information about known and resolved anomalies.
Release Notes for the Cisco MGX 8880 Media Gateway, Release 5.0.00 OL-5190-01	Provides new feature and compatibility information, as well as information about known and resolved anomalies.
Release Notes for Cisco MGX Route Processor Module (RPM-PR) IOS Release 12.3(2)T5 for MGX Releases 1.3.00 and 5.0.00 OL-4535-01	Provides upgrade and compatibility information, as well as information about known and resolved anomalies.
Release Notes for Cisco MGX Route Processor Module (RPM-XF) IOS Release 12.3(2)T5 for PXM45-based Switches, Release 5.0.00 OL-4536-01	Provides upgrade and compatibility information, as well as information about known and resolved anomalies.
Release Notes for the Cisco Voice Interworking Service Module (VISM), Release 3.2.10 OL-4544-01	Provides new feature, upgrade, and compatibility information, as well as information about known and resolved anomalies.
Release Notes for the Cisco Voice Switch Service Module (VXSM), Release 5.0.00 OL-4627-01	Provides new feature, upgrade, and compatibility information, as well as information about known and resolved anomalies.
Release Notes for Cisco WAN Manager, Release 15.0.00 OL-4151-01	Provides new feature, upgrade, and compatibility information, as well as information about known and resolved anomalies.

Obtaining Documentation

Cisco provides several ways to obtain documentation, technical assistance, and other technical resources. These sections explain how to obtain technical information from Cisco Systems.

Cisco.com

You can access the most current Cisco documentation on the World Wide Web at this URL:

http://www.cisco.com/univercd/home/home.htm

You can access the Cisco website at this URL:

http://www.cisco.com

International Cisco websites can be accessed from this URL:

http://www.cisco.com/public/countries_languages.shtml

Ordering Documentation

You can find instructions for ordering documentation at this URL:

http://www.cisco.com/univercd/cc/td/doc/es_inpck/pdi.htm

You can order Cisco documentation in these ways:

- Registered Cisco.com users (Cisco direct customers) can order Cisco product documentation from the Ordering tool:

  http://www.cisco.com/en/US/partner/ordering/index.shtml

- Nonregistered Cisco.com users can order documentation through a local account representative by calling Cisco Systems Corporate Headquarters (California, USA) at 408 526-7208 or, elsewhere in North America, by calling 800 553-NETS (6387).

Finding Documentation for Cisco MGX, BPX, SES, and CWM Products

The previous "Ordering Documentation" section applies to other Cisco documentation. Starting in 2003, all documents listed in the "Related Documentation" section are available online only unless stated otherwise. You can find the documents listed in Table 1 online as follows:

- In your browser's URL field, enter **www.cisco.com**. In the top right search field, enter the complete document part number (for example, enter **OL-4538-01**, including the -01 suffix). Click on GO.
- For the Cisco Wide Area Network Manager (CWM) documents, in your browser's URL field, enter **http://www.cisco.com/univercd/cc/td/doc/product/wanbu/svplus/index.htm** and look for the CWM release number.
- For all other documents, in your browser's URL field, enter **http://www.cisco.com/univercd/cc/td/doc/product/wanbu/index.htm**. Look for the switch name and release number. For example, look for *MGX 8850 (PXM1E)*, then *Release 5*.

Changes to This Document

Table 4 summarizes the changes made to this guide since the previous release.

Table 4 Changes to This Book Since the Previous Release

Chapter	Changes
Chapter 1, "Preparing for Configuration"	Added information about new manuals and features and made minor revisions.
Chapter 2, "Configuring General Switch Features"	Added coverage for new hardware and made minor revisions. **Note** The former chapter titled "Planning for Card Redundancy, Line Redundancy, and Bulk Distribution" has been moved to the *Cisco MGX 8850 (PXM1E/PXM45), Cisco MGX 8950, Cisco MGX 8830, and Cisco MGX 8880 Hardware Installation Guide, Releases 2 Through 5*.
Chapter 3, "Provisioning PXM1E Communication Links"	This chapter combined the information formerly published in the following chapters: "Preparing PXM1E Lines for Communication" and "Provisioning PXM1E Communications Links."
Chapter 4, "Preparing Service Modules for Communication"	This new chapter describes the procedure for configuring general service module configuration parameters. It replaces the following chapters: • Preparing AXSM Cards and Lines for Communication • Preparing FRSM12 Cards for Communication • Preparing Cell Bus Service Modules for Communication This chapter also provides information on the new MPSM cards. **Note** Information on AXSM line preparation has been moved to the *Cisco ATM Services (AXSM) Configuration Guide and Command Reference for MGX Switches, Release 5*.
Chapter 5, "Preparing SRM Cards for Communications"	This chapter has been updated to describe the new SRME/B card.
Chapter 6, "Preparing RPM Cards for Operation"	Minor revisions.

Table 4 Changes to This Book Since the Previous Release

Chapter	Changes
Chapter 7, “Managing Service Class Templates”	This chapter has been completely rewritten. A master table provide guidance for selecting SCTs, and the rest of the chapter describes SCT management and shows display command examples for PXM1E cards. For display command examples for service modules, refer to the appropriate service module guide, all of which are listed in Table 1-1.
Chapter 8, “Managing PNNI Nodes and PNNI Routing”	Some sections have been revised, and the following sections have been added: • Configuring the Deroute Delay • Managing Priority Routing • Managing Priority Bumping • Managing Connection Grooming
Chapter 9, “Switch Operating Procedures”	Some sections have been revised, and the following sections have been added: • Managing MPSM Licenses • Enabling and Disabling Telnet Access • Displaying the Telnet Enable Status • Starting and Managing Secure (SSH) Access Sessions Between Switches • Managing Remote (TACACS+) Authentication and Authorization **Note** The “Managing Priority Routing” section was moved to Chapter 8, “Managing PNNI Nodes and PNNI Routing.”
Chapter 10, “Switch Maintenance Procedures”	Revised the PXM and AXSM upgrade procedures and added the following sections: • Replacing Eight-Port T1 and E1 Service Modules with MPSM-8-T1E1 • Replacing SRM Cards with SRME/B
Chapter 11, “Viewing and Responding to Alarms”	Minor revisions due to command changes.
Appendix A, “Downloading and Installing Software Upgrades”	Minor revisions.
Appendix B, “PXM Backup Boot Procedures”	Minor revisions.
Appendix C, “Supporting and Using Additional CLI Access Options”	Added a section called “Starting a Secure (SSH) CLI Session” and made minor revisions.

Table 4 Changes to This Book Since the Previous Release

Chapter	Changes
Appendix D, "Standards Compliance"	Minor revisions.
Appendix E, "Hardware Survey and Software Configuration Worksheets"	Added the following worksheet sections: • MPSM-8-T1E1 Configuration Worksheet • MPSM-T3E3-155 Configuration Worksheet • VXSM Configuration Worksheet

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You can submit e-mail comments about technical documentation to bug-doc@cisco.com.

You can submit comments by using the response card (if present) behind the front cover of your document or by writing to the following address:

Cisco Systems
Attn: Customer Document Ordering
170 West Tasman Drive
San Jose, CA 95134-9883

We appreciate your comments.

Obtaining Technical Assistance

For all customers, partners, resellers, and distributors who hold valid Cisco service contracts, the Cisco Technical Assistance Center (TAC) provides 24-hour-a-day, award-winning technical support services, online and over the phone. Cisco.com features the Cisco TAC website as an online starting point for technical assistance. If you do not hold a valid Cisco service contract, please contact your reseller.

Cisco TAC Website

The Cisco TAC website provides online documents and tools for troubleshooting and resolving technical issues with Cisco products and technologies. The Cisco TAC website is available 24 hours a day, 365 days a year. The Cisco TAC website is located at this URL:

http://www.cisco.com/tac

Accessing all the tools on the Cisco TAC website requires a Cisco.com user ID and password. If you have a valid service contract but do not have a login ID or password, register at this URL:

http://tools.cisco.com/RPF/register/register.do

Opening a TAC Case

Using the online TAC Case Open Tool is the fastest way to open P3 and P4 cases. (P3 and P4 cases are those in which your network is minimally impaired or for which you require product information.) After you describe your situation, the TAC Case Open Tool automatically recommends resources for an immediate solution. If your issue is not resolved using the recommended resources, your case will be assigned to a Cisco TAC engineer. The online TAC Case Open Tool is located at this URL:

http://www.cisco.com/tac/caseopen

For P1 or P2 cases (P1 and P2 cases are those in which your production network is down or severely degraded) or if you do not have Internet access, contact Cisco TAC by telephone. Cisco TAC engineers are assigned immediately to P1 and P2 cases to help keep your business operations running smoothly.

To open a case by telephone, use one of the following numbers:

Asia-Pacific: +61 2 8446 7411 (Australia: 1 800 805 227)
EMEA: +32 2 704 55 55
USA: 1 800 553-2447

For a complete listing of Cisco TAC contacts, go to this URL:

http://www.cisco.com/warp/public/687/Directory/DirTAC.shtml

TAC Case Priority Definitions

To ensure that all cases are reported in a standard format, Cisco has established case priority definitions.

Priority 1 (P1)—Your network is “down” or there is a critical impact to your business operations. You and Cisco will commit all necessary resources around the clock to resolve the situation.

Priority 2 (P2)—Operation of an existing network is severely degraded, or significant aspects of your business operation are negatively affected by inadequate performance of Cisco products. You and Cisco will commit full-time resources during normal business hours to resolve the situation.

Priority 3 (P3)—Operational performance of your network is impaired, but most business operations remain functional. You and Cisco will commit resources during normal business hours to restore service to satisfactory levels.

Priority 4 (P4)—You require information or assistance with Cisco product capabilities, installation, or configuration. There is little or no effect on your business operations.

Obtaining Additional Publications and Information

Information about Cisco products, technologies, and network solutions is available from various online and printed sources.

- Cisco Marketplace provides a variety of Cisco books, reference guides, and logo merchandise. Go to this URL to visit the company store:

  http://www.cisco.com/go/marketplace/

- The Cisco *Product Catalog* describes the networking products offered by Cisco Systems, as well as ordering and customer support services. Access the Cisco Product Catalog at this URL:

  http://cisco.com/univercd/cc/td/doc/pcat/

- *Cisco Press* publishes a wide range of general networking, training and certification titles. Both new and experienced users will benefit from these publications. For current Cisco Press titles and other information, go to Cisco Press online at this URL:

  http://www.ciscopress.com

- *Packet* magazine is the Cisco quarterly publication that provides the latest networking trends, technology breakthroughs, and Cisco products and solutions to help industry professionals get the most from their networking investment. Included are networking deployment and troubleshooting tips, configuration examples, customer case studies, tutorials and training, certification information, and links to numerous in-depth online resources. You can access Packet magazine at this URL:

  http://www.cisco.com/packet

- *iQ Magazine* is the Cisco bimonthly publication that delivers the latest information about Internet business strategies for executives. You can access iQ Magazine at this URL:

  http://www.cisco.com/go/iqmagazine

- *Internet Protocol Journal* is a quarterly journal published by Cisco Systems for engineering professionals involved in designing, developing, and operating public and private internets and intranets. You can access the Internet Protocol Journal at this URL:

  http://www.cisco.com/ipj

- Training—Cisco offers world-class networking training. Current offerings in network training are listed at this URL:

  http://www.cisco.com/en/US/learning/index.html

CHAPTER 1

Preparing for Configuration

This document provides general configuration information and procedures for the Cisco MGX 8850 (PXM1E/PXM45), Cisco MGX 8950, and Cisco MGX 8830 switches. Use this document after you have installed your switch according to the instructions in the *Cisco MGX 8850 (PXM1E/PXM45), Cisco MGX 8950, Cisco MGX 8830, and Cisco MGX 8880 Hardware Installation Guide, Releases 2 Through 5.*

Use this document in conjunction with the *Cisco MGX 8850 (PXM45/PXM1E), Cisco MGX 8950, Cisco MGX 8830, and Cisco MGX 8880 Command Reference, Release 5.* The command reference manual contains detailed information about the commands used to configure and display information about the switch.

Note If your MGX switch will be part of a PNNI network, you can use the *Cisco PNNI Network Planning Guide for MGX and SES Products* to help you define the ATM and PNNI configuration parameters that you can configure using the procedures in the this guide.

This document tells you how to do the following tasks:

- Complete basic switch configuration tasks such as setting the time, configuring administrator access, and configuring the ATM address.
- Prepare all cards and lines for operation in the switch.
- Provision communication links on PXM1E controller cards.
- Perform general switch operating procedures.
- Perform maintenance procedures, such as replacing cards.
- Perform software upgrades for the cards in your switch.
- Perform switch-specific PNNI procedures.

Note This document does not cover link provisioning for any cards except for PXM1E. To provision links on the specific service modules, refer to the appropriate service module software configuration guide (see Table 1-1).

Table 1-1 Card-specific Configuration Guides

Service Module	Software Configuration Guide Title
AUSM/B and MPSM cards	*Cisco ATM Services (AUSM/MPSM) Configuration Guide and Command Reference for MGX Switches, Release 5*
AXSM cards	*Cisco ATM Services (AXSM) Configuration Guide and Command Reference for MGX Switches, Release 5*
CESM and MPSM cards	*Cisco Circuit Emulation Services (CESM/MPSM) Configuration Guide and Command Reference for MGX Switches, Release 5*
FRSM and MPSM cards	*Cisco Frame Relay Services (FRSM/MPSM) Configuration Guide and Command Reference for MGX Switches, Release 5*
FRSM12	*Cisco Frame Relay Software Configuration Guide and Command Reference for the Cisco MGX 8850 (PXM45) FRSM-12-T3E3 Card, Release 3*
MPSM-T3E3-155	*Cisco ATM and Frame Relay Services (MPSM-T3E3-155) Configuration Guide and Command Reference for MGX Switches, Release 5*
RPM-PR cards	*Cisco MGX Route Processor Module (RPM-PR) Installation and Configuration Guide, Release 2.1*
RPM-XF cards	*Cisco MGX Route Processor Module (RPM-XF) Installation and Configuration Guide, Release 4*
VISM-PR cards	*Cisco Voice Interworking Services (VISM) Configuration Guide and Command Reference, Release 3.2*
VXSM cards	*Cisco Voice Switch Services (VXSM) Configuration Guide and Command Reference for MGX Switches and Media Gateways, Release 5*

After your switch is configured and your links are provisioned, you can use this document as a reference for operational, maintenance, and upgrade procedures.

Keep the following statements in mind as you read this document:

- The generic term “MGX switch” refers to all MGX switches that support Release 5 software (listed in Table 1-2). If a procedure or step is specific to only one or two of the MGX switches, it will be specified in the text.
- The generic term “PXM” refers to both the PXM45 card and the PXM1E card. If a procedure or step is specific to only one of the PXMs, it will be specified in the text.
- Throughout this guide, the term PXM45 is a generic term used to refer to PXM45/A, PXM45/B, and PXM45/C cards.
- On MGX switches, the PXM card is the controller card that controls the other cards on the switch. The other cards on the switch are called service modules.
- Throughout this guide, the term AXSM is used to refer to all the AXSM cards. If a procedure or paragraph applies to only a specific AXSM card or specific AXSM cards, it will be specified as such. The first release of the AXSM cards are labeled “AXSM,” but are often referred to as AXSM/A cards. The second release of AXSM cards are labeled and called AXSM/B cards. Other AXSM models include the AXSM-E and AXSM-XG card families.
- Cisco MGX Release 5 software supports a number of single-height service modules (listed in Table 1-2) that were originally designed to operate in Cisco MGX 8850 (PXM1) switches. These service modules use the cell bus to transport traffic to other services modules or PXM uplinks and are commonly referred to as cell bus service modules (CBSMs). (The CBSMs have also been called

Narrow Band Service Modules (NBSMs) in Cisco documentation.) The CBSM term is used to refer to this class of cards as a whole. CBSM cards include the AUSM, CESM, FRSM, 8-port MPSM, RPM, RPM-PR, and VISM card families.

Note The AXSM and FRSM-12-T3E3 cards are not CBSMs. They are full-height cards that communicate with the PXM45 and other service modules through the serial bus.

Once you have installed your switch and completed the general configuration procedures described in this guide, refer to the service module documentation for information on provisioning and managing individual services such as ATM, circuit emulation, Frame Relay, and IP.

This chapter introduces the Cisco MGX multiservice switches and common switch topologies, provides an overview of the configuration process, and presents guidelines for collecting the information you will need to complete the configuration.

Cisco MGX Switch Features

The Cisco MGX multiservice switches provide support for the following features:

- Permanent virtual circuits (PVCs)
- Permanent virtual paths (PVPs)
- Soft permanent virtual paths (SPVPs)
- Soft permanent virtual circuits (SPVCs)
- Switched virtual circuits (SVCs)
- Switched virtual paths (SVPs)

The following table identifies the capabilities supported by each of the Cisco MGX switches and the Cisco MGX 8880 Media Gateway.

Table 1-2 Cisco MGX 8830, Cisco MGX 8850 (PXM1E/PXM45), Cisco MGX 8880, and Cisco MGX 8950 Capabilities

Feature	Cisco MGX 8850 (PXM1E)	Cisco MGX 8830 (PXM1E)	Cisco MGX 8850 (PXM45)	Cisco MGX 8880 (PXM45/C)	Cisco MGX 8950 (PXM45)
Total Number of Slots	2 double height slots and 28 single height slots.	2 double height slots and 10 single height slots.	2 double height slots and 28 single height slots.	2 double height slots and 28 single height slots.	2 double height slots and 28 single height slots.
Slots Reserved for Processor Cards	2 double height slots.	2 double height slots.	2 double height slots.	2 double height slots.	2 double height slots.
Slots Reserved for SRM Cards	4 single height slots	2 single height slots	4 single height slots	4 single height slots	—
Slots Reserved for XM-60 Cards	—	—	—	—	4 single height slots
Slots for Service Modules	24 single height slots, or 12 double height slots, or a combination of both.[1]	8 single height slots, or 4 double height slots, or a combination of both.[1]	24 single height slots, or 12 double height slots, or a combination of both.[1]	24 single height slots, or 12 double height slots, or a combination of both.[1]	24 single height slots, or 12 double height slots, or a combination of both.[1]

Table 1-2 Cisco MGX 8830, Cisco MGX 8850 (PXM1E/PXM45), Cisco MGX 8880, and Cisco MGX 8950 Capabilities

Feature	Cisco MGX 8850 (PXM1E)	Cisco MGX 8830 (PXM1E)	Cisco MGX 8850 (PXM45)	Cisco MGX 8880 (PXM45/C)	Cisco MGX 8950 (PXM45)
Physical Attributes					
Height	29.75 inches	14 inches	29.75 inches	29.75 inches	29.75 inches
Width	17.72 inches	17.72 inches	17.72 inches	17.72 inches	17.72 inches
Depth	21.5 inches	21.5	21.5 inches	21.5 inches	21.5 inches
Services					
Local Switching	Yes	Yes	Yes	Yes	Yes
PNNI Routing	Yes	Yes	Yes	Yes	Yes
IGX Feeder Support	Yes	Yes	Yes	Yes	No
MGX 8250, MGX 8250, and MGX 8850 (PXM1) Feeder Support	Yes	Yes	Yes	Yes	Yes
Automatic Protection Switching (APS 1+1)	Yes. (on PXM1E and SRME)	Yes (on PXM1E and SRME)	Yes (on AXSM and SRME)	Yes (on AXSM and SRME)	Yes (on AXSM)
IMA	Yes. (on PXM1E-16-T1E1, AUSM/B, MPSM-8-T1E1, and MPSM-T3E3-155)	Yes (on PXM1E-16-T1E1, AUSM/B, MPSM-8-T1E1, and MPSM-T3E3-155)	Yes (on the AXSM-32-T1E1-E and MPSM-T3E3-155)	Yes (on the AXSM-32-T1E1-E)	No
Multilink Frame Relay	MPSM-T3E3-155	MPSM-T3E3-155	MPSM-T3E3-155	—	—
Switching Capacity	1.2 Gbps	1.2 Gbps	45 Gbps	45 Gbps	240 Gbps

Table 1-2 Cisco MGX 8830, Cisco MGX 8850 (PXM1E/PXM45), Cisco MGX 8880, and Cisco MGX 8950 Capabilities

Feature	Cisco MGX 8850 (PXM1E)	Cisco MGX 8830 (PXM1E)	Cisco MGX 8850 (PXM45)	Cisco MGX 8880 (PXM45/C)	Cisco MGX 8950 (PXM45)
Trunk/Port Interfaces					
T1/E1	AUSM-8E1/B - 8 ports AUSM-8T1/B - 8 ports CESM-8E1 - 8 ports CESM-8T1/B - 8 ports FRSM-8E1 - 8 ports FRSM-8E1-C - 8 ports (channelized) FRSM-8T1 - 8 ports FRSM-8T1-C - 8 ports (channelized) MPSM-8-T1E1 PXM1E-16-T1E1 - 16 ports VISM-PR-8E1 - 8 ports VISM-PR-8T1 - 8 ports	AUSM-8E1/B - 8 ports AUSM-8T1/B - 8 ports CESM-8E1 - 8 ports CESM-8T1/B - 8 ports FRSM-8E1 - 8 ports FRSM-8E1-C - 8 ports (channelized) FRSM-8T1 - 8 ports FRSM-8T1-C - 8 ports (channelized) MPSM-8-T1E1 PXM1E-16-T1E1 - 16 ports VISM-PR-8E1 - 8 ports VISM-PR-8T1 - 8 ports	AXSM-32-T1E1-E - 32 ports CESM-8E1[2] - 8 ports CESM-8T1[3] - 8 ports CESM-8T1/B[2] - 8 ports FRSM-8E1[2] - 8 ports FRSM-8E1-C[2] - 8 ports (channelized) FRSM-8T1[2] - 8 ports FRSM-8T1-C[2] - 8 ports (channelized) MPSM-8-T1E1 VISM-PR-8E1 - 8 ports VISM-PR-8T1 - 8 ports VXSM-48-T1E1 - 48 ports	AXSM-32-T1E1-E - 32 ports VISM-PR-8E1 - 8 ports VISM-PR-8T1 - 8 ports VXSM-48-T1E1 - 48 ports	—

Table 1-2 Cisco MGX 8830, Cisco MGX 8850 (PXM1E/PXM45), Cisco MGX 8880, and Cisco MGX 8950 Capabilities

Feature	Cisco MGX 8850 (PXM1E)	Cisco MGX 8830 (PXM1E)	Cisco MGX 8850 (PXM45)	Cisco MGX 8880 (PXM45/C)	Cisco MGX 8950 (PXM45)
T3/E3	FRSM-2CT3 - 2 ports (channelized) FRSM-2T3E3 - 2 ports MPSM-T3E3-155 PXM1E-8T3/E3 - 8 ports PXM-COMBO - 8 ports SRM-3T3/C - 3 ports SRME/B - 3 T3 ports[4]	FRSM-2CT3 - 2 ports (channelized) FRSM-2T3E3 - 2 ports MPSM-T3E3-155 PXM1E-8T3/E3 - 8 ports PXM-COMBO - 8 ports SRM-3T3/C - 3 ports SRME/B - 3 T3 ports[4]	AXSM-16-E3 - 16 ports AXSM-16-E3/B - 16 ports AXSM-16-E3-E - 16 ports AXSM-16-T3 - 16 ports AXSM-16-T3/B - 16 ports AXSM-16-T3-E - 16 ports FRSM-2CT3[2] - 2 ports (channelized) FRSM12-T3E3 - 12 ports (channelized) MPSM-T3E3-155 SRM-3T3/C[2] - 3 ports SRME/B[2] - 3 T3 ports[4]	AXSM-16-E3/B - 16 ports AXSM-16-E3-E - 16 ports AXSM-16-T3/B - 16 ports AXSM-16-T3-E - 16 ports SRME/B[2] - 3 T3 ports[4]	AXSM-16-T3/B - 16 ports AXSM-16-E3/B - 16 ports
OC-3/STM-1	MPSM-T3E3-155 PXM-COMBO - 4 ports PXM1E-4-155 - 4 ports PXM1E-8-155 - 8 ports SRME[5] - 1 port SRME/B[5] - 1 port	MPSM-T3E3-155 PXM-COMBO - 4 ports PXM1E-4-155 - 4 ports PXM1E-8-155 - 8 ports SRME[5] - 1 port SRME/B[5] - 1 port	AXSM-8-155-E - 8 ports AXSM-16-155 - 16 ports AXSM-16-155/B - 16 ports AXSM-16-155-XG - 16 ports MPSM-T3E3-155 SRME - 1 port SRME/B[5] - 1 port VXSM-4-155 - 4 ports	AXSM-8-155-E - 8 ports AXSM-16-155/B - 16 ports VXSM-4-155 - 4 ports	AXSM-16-155/B - 16 ports AXSM-16-155-XG[6, 7] - 16 ports

Table 1-2 Cisco MGX 8830, Cisco MGX 8850 (PXM1E/PXM45), Cisco MGX 8880, and Cisco MGX 8950 Capabilities

Feature	Cisco MGX 8850 (PXM1E)	Cisco MGX 8830 (PXM1E)	Cisco MGX 8850 (PXM45)	Cisco MGX 8880 (PXM45/C)	Cisco MGX 8950 (PXM45)
OC-12c/STM-4	—	—	AXSM-4-622 - 4 ports AXSM-2-622-E - 2 ports AXSM-4-622/B - 4 ports	AXSM-2-622-E - 2 ports AXSM-4-622/B - 4 ports	AXSM-4-622/B - 4 ports
OC-48c/STM-16	—	—	AXSM-1-2488 - 1 port AXSM-1-2488/B - 1 port	AXSM-1-2488/B - 1 port	AXSM-1-2488/B - 1 port AXSM-4-2488-XG [6] - 4 ports
OC-192c/STM-64	—	—	—	—	AXSM-1-9953-XG [6] - 1 port
HSSI	FRSM-HS2/B - 2 ports	FRSM-HS2/B - 2 ports	FRSM-HS2/B[2] - 2 ports	—	—
Supported Controller Cards					
PXM1E	Yes	Yes	No	No	No
PXM45	No	No	Yes	No	No
PXM45/B	No	No	Yes	No	Yes
PXM45/C	No	No	Yes	Yes	Yes
Supported Routing Protocols					
PNNI	Yes	Yes	Yes	Yes	Yes
MPLS[8]	No	No	Yes	Yes	Yes
Supported Services					
ATM services	AUSM-8E1/B AUSM-8T1/B MPSM-8-T1E1 MPSM-T3E3-155 PXM1E	AUSM-8E1/B AUSM-8T1/B MPSM-8-T1E1 MPSM-T3E3-155 PXM1E	AXSM cards—all MPSM-T3E3-155	All AXSM/B and AXSM-E cards	Supported on the AXSM-XG and all AXSM/B cards
Frame Relay	FRSM-2CT3 FRSM-2T3E3 FRSM-8E1 FRSM-8E1-C FRSM-8T1 FRSM-8T1-C FRSM-HS2/B MPSM-8-T1E1 MPSM-T3E3-155	FRSM-2CT3 FRSM-2T3E3 FRSM-8E1 FRSM-8E1-C FRSM-8T1 FRSM-8T1-C FRSM-HS2/B MPSM-8-T1E1 MPSM-T3E3-155	FRSM-2CT3[2] FRSM-8E1[2] FRSM-8E1-C[2] FRSM-8T1[2] FRSM-8T1-C[2] FRSM-12-T3E3[2] FRSM-HS2/B[2] MPSM-8-T1E1 MPSM-T3E3-155	No	No

Table 1-2 Cisco MGX 8830, Cisco MGX 8850 (PXM1E/PXM45), Cisco MGX 8880, and Cisco MGX 8950 Capabilities

Feature	Cisco MGX 8850 (PXM1E)	Cisco MGX 8830 (PXM1E)	Cisco MGX 8850 (PXM45)	Cisco MGX 8880 (PXM45/C)	Cisco MGX 8950 (PXM45)
Circuit Emulation	CESM-8E1 CESM-8T1/B MPSM-8-T1E1	CESM-8E1 CESM-8T1/B MPSM-8-T1E1	CESM-8E1[2] CESM-8T1[3] CESM-8T1/B[2] MPSM-8-T1E1	No	No
Voice	VISM-PR-8E1 VISM-PR-8T1	VISM-PR-8E1 VISM-PR-8T1	VISM-PR-8E1 VISM-PR-8T1 VXSM-4-155 VXSM-48-T1E1	VISM-PR-8E1 VISM-PR-8T1 VXSM-4-155 VXSM-48-T1E1	No
IP	RPM-PR	RPM-PR	RPM-PR RPM-XF	RPM-PR RPM-XF	RPM-PR RPM-XF
Service Resource Module (SRM)	SRM-3T3/C SRME[5] SRME/B	SRM-3T3/C SRME[5] SRME/B	SRM-3T3/C[2] SRME[5] SRME/B	SRME/B	No
1:1 Card Redundancy	Preconfigured for PXM and SRM. Supported for select service modules as listed in the *Cisco MGX 8850 (PXM1E/PXM45), Cisco MGX 8950, Cisco MGX 8830, and Cisco MGX 8880 Hardware Installation Guide, Releases 2 Through 5*.				Preconfigured for PXM. Supported for select service modules as listed in the *Cisco MGX 8850 (PXM1E/PXM45), Cisco MGX 8950, Cisco MGX 8830, and Cisco MGX 8880 Hardware Installation Guide, Releases 2 Through 5*.
1:N Card Redundancy	Supported for select service modules as listed in the *Cisco MGX 8850 (PXM1E/PXM45), Cisco MGX 8950, Cisco MGX 8830, and Cisco MGX 8880 Hardware Installation Guide, Releases 2 Through 5*.				Only for RPM.
Intracard APS Line Redundancy	Supported only on PXM1E as listed in the *Cisco MGX 8850 (PXM1E/PXM45), Cisco MGX 8950, Cisco MGX 8830, and Cisco MGX 8880 Hardware Installation Guide, Releases 2 Through 5*.		Supported for select service modules as listed in the *Cisco MGX 8850 (PXM1E/PXM45), Cisco MGX 8950, Cisco MGX 8830, and Cisco MGX 8880 Hardware Installation Guide, Releases 2 Through 5*.		

Table 1-2 Cisco MGX 8830, Cisco MGX 8850 (PXM1E/PXM45), Cisco MGX 8880, and Cisco MGX 8950 Capabilities

Feature	Cisco MGX 8850 (PXM1E)	Cisco MGX 8830 (PXM1E)	Cisco MGX 8850 (PXM45)	Cisco MGX 8880 (PXM45/C)	Cisco MGX 8950 (PXM45)
Intercard APS Line Redundancy	Supported on PXM1E, SRME, and SRME/B as listed in the *Cisco MGX 8850 (PXM1E/PXM45), Cisco MGX 8950, Cisco MGX 8830, and Cisco MGX 8880 Hardware Installation Guide, Releases 2 Through 5*		Supported on SRME, SRME/B, and select service modules as listed in the *Cisco MGX 8850 (PXM1E/PXM45), Cisco MGX 8950, Cisco MGX 8830, and Cisco MGX 8880 Hardware Installation Guide, Releases 2 Through 5*.	Supported on SRME/B and select service modules as listed in the *Cisco MGX 8850 (PXM1E/PXM45), Cisco MGX 8950, Cisco MGX 8830, and Cisco MGX 8880 Hardware Installation Guide, Releases 2 Through 5*.	Supported for select service modules as listed in the *Cisco MGX 8850 (PXM1E/PXM45), Cisco MGX 8950, Cisco MGX 8830, and Cisco MGX 8880 Hardware Installation Guide, Releases 2 Through 5*.
Bulk Distribution	Supported for select service modules as listed in the *Cisco MGX 8850 (PXM1E/PXM45), Cisco MGX 8950, Cisco MGX 8830, and Cisco MGX 8880 Hardware Installation Guide, Releases 2 Through 5*.				No
Bit Error Rate Testing (BERT)	Supported through SRM cards for AUSM, CESM, FRSM, and VISM-PR T1/E1 cards. Also supported on MPSM-8-T1E1 with or without SRM.			Supported through SRME/B card for VISM-PR T1/E1 cards.	No
UNI	Supported on all PXM1E and AUSM cards		Supported on all AXSM cards		
NNI	Supported on all PXM1E, FRSM, AUSM/B, and MPSM cards		Supported on all AXSM, FRSM, MPSM, and VXSM cards	Supported on all AXSM and VXSM cards	Supported on all AXSM cards
SPVCs	Supported on all AUSM, CESM, FRSM, PXM1E, and RPM cards		Supported on all AXSM, CESM, FRSM, and RPM cards	Supported on all AXSM and RPM cards	Supported on all AXSM and RPM cards
SVCs	Supported on all PXM1E cards	Supported on all PXM1E cards	Supported on all AXSM cards	Supported on all AXSM cards	Supported on all AXSM cards
Closed User Groups (CUGs)	Yes	Yes	Yes	Yes	Yes

1. Single-height and double-height cards can be mixed in a chassis if the switch model supports both types. Double-height cards require two single card slots.
2. Supported only on PXM45/B and PXM45/C cards.
3. Supported only on PXM45/B and PXM45/C cards. Although the PXM45/B can support CESM-8T1 cards, Cisco recommends using the CESM-8T1/B.
4. SRME/B cards do not support E3 ports.
5. SRME APS line redundancy is only supported on PXM45/B and PXM45/C.
6. You must have four XM-60 cards installed on your Cisco MGX 8950 switch before you install any AXSM-XG cards.
7. Supported only on Release 5 switches.
8. For Cisco MGX 8850 (PXM45) and Cisco MGX 8950 switches, MPLS and PNNI can be used simultaneously on the same switch and on the same link.

Table 1-3 illustrates the differences between the PXM45/A, PXM45/B, and PXM45/C cards.

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Table 1-3 Differences between PXM 45 Cards

Feature	PXM45[1]	PXM45/B	PXM45/C
Maximum number of UNI/NNI interfaces per node supported	192	4,000	4,000
Maximum number of preferred routes supported	5,000	5,000	10,000
Maximum number of narrowband connections supported	N/A	27 k	27 k
Maximum number of SPVC/SVC connections supported	250 k	250 k	250k
Maximum number of PNNI links supported	100	100	128

1. The PXM45 is sometimes called the PXM45/A and is not supported in Release 5 software.

Typical Topologies

Release 5 of the Cisco MGX 8850 (PXM45) and Cisco MGX 8950 switches support the following topologies:

- Core switch
- Multiservice edge aggregation
- DSL edge aggregation

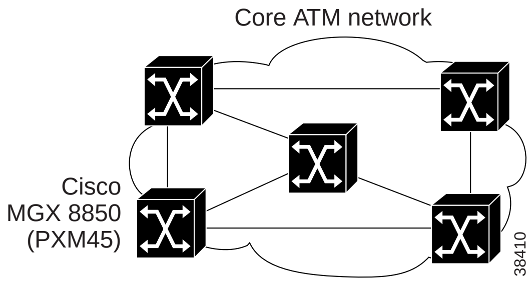
Release 5 of the Cisco MGX 8850 (PXM1E) and Cisco MGX 8830 switches supports the following topologies:

- Multiservice edge aggregation
- DSL edge aggregation

Core Switch

Figure 1-1 shows the switch operating in a core switch topology.

Figure 1-1 Core Switch Topology



In the core switch topology, the switch works with other ATM switches to transfer broadband ATM traffic from one ATM edge device to another. The core acts like a freeway, and the edge devices act like freeway on-ramps.

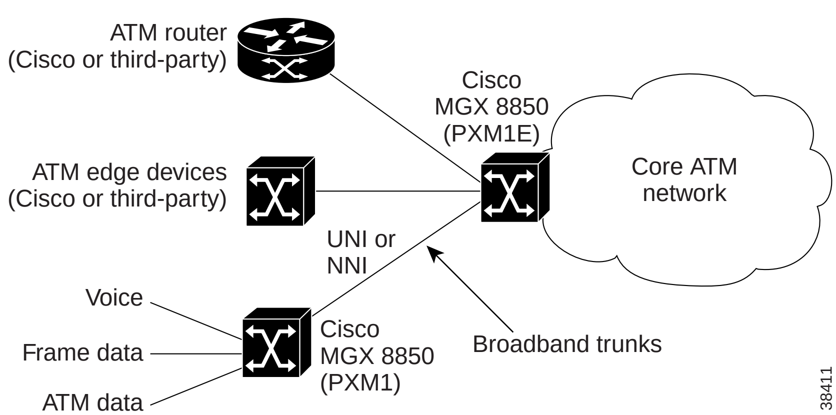
Note Typically, Cisco MGX 8850 (PXM45) and Cisco MGX 8950 switches are deployed in the network core, whileCisco MGX 8830, Cisco MGX 8850 (PXM1E) and the Cisco MGX 8880 Media Gateway are deployed at the network edge.

Typically, core edge nodes communicate with multiple external nodes over relatively slow broadband trunks such as DS3, OC-3, and STM-1 trunks. The internal core node communicates with other core nodes using relatively fast links such as OC-12, OC-48, and STM-16 trunks.

Multiservice Edge Aggregation

Figure 1-2 shows an MGX switch operating in a multiservice edge aggregation topology.

Figure 1-2 Multiservice Edge Aggregation Topology

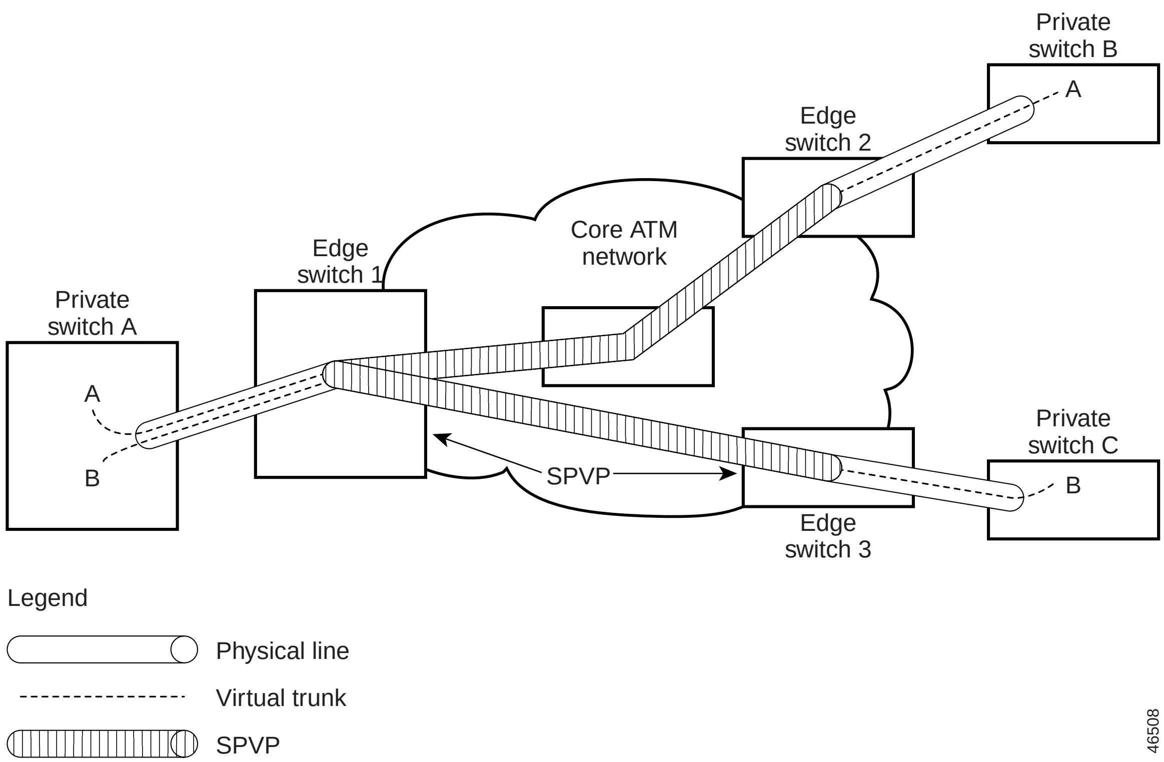


The Cisco MGX 8850 (PXM1) node in Figure 1-2 is called a feeder node. In the multiservice edge aggregation topology, the feeder node is co-located with other ATM equipment and communicates with one or more core switches at remote locations. The switch aggregates the traffic from local ATM devices and packages it for high-speed communications over the core. Cisco MGX 8850 (PXM1E/PXM45) and Cisco MGX 8830 switches support feeder connections from Cisco MGX 8230, Cisco MGX 8250, Cisco MGX 8850 (PXM1), and Cisco IGX nodes.

Typically, multiservice edge nodes communicate with colocated ATM devices over relatively slow broadband trunks such as DS3 and E3 trunks. The multiservice edge node communicates with core nodes using relatively fast links such as OC-12, OC-48, and STM-16 trunks.

Cisco MGX edge nodes also support virtual trunks as shown in Figure 1-3.

Figure 1-3 Virtual Trunk Topology



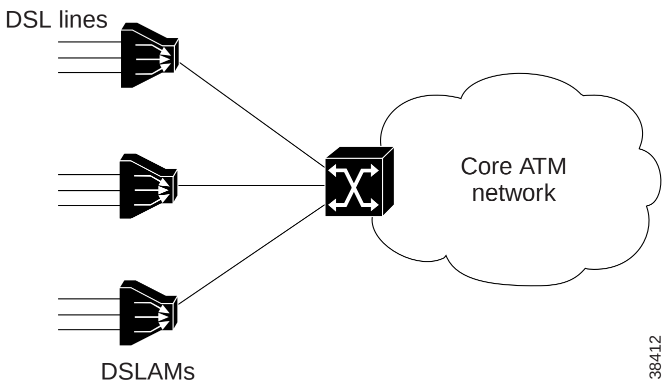
A virtual trunk provides a private virtual network path through an independent network such as a public ATM network. Using virtual trunks, Company A can establish a private virtual path between two sites using a public ATM network that supports this feature. From Company A’s point of view, it has a private virtual path between the two sites that can support multiple virtual circuits (VCs). Company A’s network topology is completely private, as all communications are simply passed between edge devices, with no need for translation or routing. To accomplish this configuration, the virtual trunk supports the Service Specific Connection Oriented Protocol (SSCOP) (virtual channel identifier [VCI = 5]), Private Network-to-Network Interface (PNNI) (VCI = 18) and Integrated Local Management Interface (ILMI) (VCI = 16) signaling protocols.

Figure 1-3 shows two virtual trunks, Virtual Trunk A and Virtual Trunk B. At Private Switch A, both virtual trunks use the same line to connect to the core ATM network. Within the core ATM network, soft virtual permanent paths (SPVPs) are defined to enable direct communications between the core edge nodes. The result is that Private Switch A has virtual trunks to Private Switches B and C and communicates with them as though they were directly connected.

DSL Aggregation

Figure 1-4 shows an MGX switch operating in a Digital Subscriber Line (DSL) edge aggregation topology.

Figure 1-4 DSL Edge Aggregation Topology



In the DSL edge aggregation topology, the switch is colocated with Digital Subscriber Line Access Multiplexers (DSLAMs) and communicates with one or more core switches at remote locations. The switch aggregates the DSL traffic from multiple DSLAMs and packages it for high-speed communications over the core.

Typically, DSL edge nodes communicate with colocated DSLAMs over relatively slower broadband trunks such as DS3 and E3 trunks. The DSL edge node communicates with core nodes using relatively faster links such as OC-3, OC-12, and OC-48 trunks.

Configuration Overview

Switch configuration is easier if you are familiar with the overall configuration process. To configure and start up the switch, you need to do some or all of the following tasks:

- Collect information you will need during the configuration process
- Configure general switch features
- Configure the physical connections to other devices
- Provision ATM connections
- Enable PNNI call routing

The sections that follow describe how to collect or create the information you need to complete these tasks.

Collecting Information

During configuration, you will need to enter general configuration data that describes the switch, enables administrator access, and enables switch participation in the network. This data includes

- Unique Switch Name
- IP Addressing Plan
- ATM Addressing Plan
- Administrator Data
- Unique Device Identifier
- Administrator Access Method
- Guidelines for Creating a Network Clock Source Plan
- Network Management Plan
- Physical Location of Cards and Lines in the Switch

The following sections describe these topics in more detail. Appendix E, "Hardware Survey and Software Configuration Worksheets," provides tables that you can use to record the data you develop during configuration planning.

Unique Switch Name

Each switch must have its own name (which consists of up to 32 characters), unique within the ATM network. If you are adding a switch to a network, find out if the network administrator has established switch naming conventions, and find out which names have already been used. It is a good practice to name switches according to location, as such names convey both the switch identity and its location. The procedure for setting the name is described in the "Setting and Viewing the Node Name" section in Chapter 2, "Configuring General Switch Features."

IP Addressing Plan

An IP network addressing plan is required for switch management. IP network addressing is described in the "Guidelines for Creating an IP Address Plan" section later in this chapter.

ATM Addressing Plan

An ATM network addressing plan is critical for successful operation of MGX switches in an ATM network. PNNI networks require unique ATM addresses on each switch. However, the PNNI protocol uses structured network addresses to logically group network devices and determine routes between devices. For PNNI networks, an ATM address plan is required.

PNNI network addressing is described in the *Cisco PNNI Network Planning Guide for MGX and SES Products*.

Administrator Data

In most cases, more than one administrator will manage the switch. The MGX switches support multiple administrators and several different administration levels. As part of the planning process, you might identify who will manage the switch and at what level. You can learn more about managing administrators by reading the "Configuring User Access" section in Chapter 2, "Configuring General Switch Features."

Unique Device Identifier

Cisco products have an electronically retrievable identifier. This identifier is called the Unique Device Identifier (UDI) and consists of the Product Identifier (PID), the Version Identifier (VID), and the hardware Serial Number (SN). The UDI is programmed at the factory and is stored in non-volatile memory.

The UDI is used to identify specific equipment for inventory management, asset management, entitlement, business operations management, network implementation, and network management.

In network management, the UDI enables network administrators to easily track specific components in their network.

You can display the UDI by issuing the **show inventory** command from the command line interface (CLI). The **show inventory** command displays the information shown in Table 1-4.

Table 1-4 Show Inventory Command Display Output

Field	Description
NAME:	The name or number of the component set by Cisco. For example, "1" or "11".
DESCR:	The description of the component as defined by Cisco. For example, "Cisco MGX8850, 32 Slot chassis".
PID:	The product identifier – the model name of the device as defined by Cisco. For example, "MGX8850" or "AXSM-4-622".
VID:	The version identifier – the hardware version number defined by Cisco. For example, "000".
SN:	The hardware serial number inscribed at the factory. For example, "SN1234567890".

The following example shows the **show inventory** command and its output:

```
MGX8850.8.PXM.a > show inventory

NAME: "1"      , DESCR: "Cisco MGX8850 Backplane"
PID: MGX8850             , VID: 000, SN: SN1234567890

NAME: "1"     , DESCR: "Double-height ATM SM, 4 OC-12c/STM-4"
PID: AXSM-4-622          , VID: 000, SN: SN1234567890

MGX8850.8.PXM.a >
```

MIB Field Names for UDI

The MIB field names that contain the UDI information are as follows:

Table 1-5 MIB Field Names for UDI

UDI Field	MIB Field Name
NAME:	Entity-MIB.entPhysicalName (Product Name)
DESCR:	Entity-MIB.entPhysicalDescr (Product Description)
PID:	Entity-MIB.entPhysicalModelName (PID)
VID:	Entity-MIB.entPhysicalHardwareRev (VID)
SN:	Entity-MIB.entPhysicalSerialNumber (SN)

Administrator Access Method

Beginning in Release 5, the Cisco MGX switch supports secure access for CLI management sessions. In prior releases the switch supported insecure Telnet access. The secure access feature encrypts the administrator's user ID and password, and all session activity. As an administrator, you can now disable Telnet access to force all CLI management sessions to use the secure access method. When planning for configuration, consider which access method you want to use and whether you want to disable Telnet access. For more information on establishing secure sessions, see "Starting a Secure (SSH) CLI Session" in Appendix C, "Supporting and Using Additional CLI Access Options." For information on disabling Telnet access, see "Enabling and Disabling Telnet Access" in Chapter 9, "Switch Operating Procedures."

Network Clock Source Plan

A network clock source plan is recommended for switch synchronization. This topic is described in the "Guidelines for Creating a Network Clock Source Plan" section later in this chapter.

Network Management Plan

You can use the following tools to manage the Cisco MGX switches:

- command line interface (CLI) provided with the switch
- Cisco WAN Manager
- Cisco View
- Third-party SNMP manager

The CLI that comes with the switch is the least expensive option. To use the other tools, you must purchase Cisco WAN Manager (CWM) or a Simple Network Management Protocol (SNMP) manager. The MGX switches come with an SNMP agent for use with an SNMP manager.

The advantage to using CWM or an SNMP manager is that you can use one program to simultaneously manage multiple devices. Also, CWM is the only management tool that can configure Service Class Templates (SCTs). Most installations require at least one CWM workstation to complete the switch configuration.

CiscoView is a CWM component that can be used independently of CWM to provide limited monitoring and management capabilities.

To determine which versions of CWM and CiscoView are compatible with this release, refer to the following release note documents:

- *Release Notes for Cisco MGX 8850 (PXM1E/PXM45), Cisco MGX 8950, and Cisco MGX 8830 Switches, Release 5.0.00*.
- *Release Notes for the Cisco MGX 8880 Media Gateway, Release 5.0.00*

For information on managing the switch with an SNMP manager, refer to the *Cisco MGX 8850 SNMP Reference, Release 4*.

Physical Location of Cards and Lines in the Switch

Many configuration features depend on a specific hardware installation configuration. The following list provides some samples of how the software configuration depends on the hardware installation:

- The software for each switch supports a specific set of processor cards and service modules.
- The software for each switch expects to find each card type in specific slots.
- Redundant card configurations can require that redundant cards be placed in a specific relationship to each other.
- Redundant line configurations can require additional hardware and require that redundant lines be be placed in a specific relationship to each other.

Table 2-9 shows where each card can be installed, and it shows which front and back cards are compatible with each other. Before starting switch configuration, take some time to review the card redundancy and line redundancy planning information in the *Cisco MGX 8850 (PXM1E/PXM45), Cisco MGX 8950, Cisco MGX 8830, and Cisco MGX 8880 Hardware Installation Guide, Releases 2 Through 5*. It is wise to review the hardware installation before you begin configuration. If the hardware installation does not support the planned software configuration, either the hardware installation or the software configuration must change.

Guidelines for Creating an IP Address Plan

This section discusses local connectivity through the PXM LAN port. For information on using terminal servers, modems and CWM to remotely access the switch, see Appendix C, “Supporting and Using Additional CLI Access Options.”

You can access the switch through three types of user interfaces: CLI, SNMP, and CWM. The switch has local ports in support of these interfaces, and each of these ports has a user-configurable IP address. The local ports are as follows:

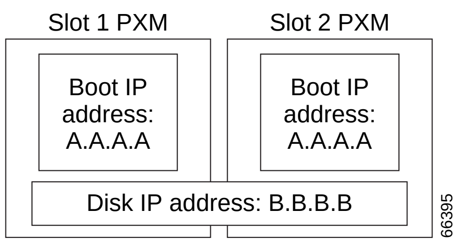
- Console Port (CP)
- Maintenance Port (MP)
- LAN 1 port
- ATM interface

Basic switch configuration and management can be completed by using a local terminal connected to the console port. However, to configure and manage the switch from a LAN connection, a modem connection, or with CWM, you need define an IP address for the appropriate interface.

MGX switches provide two IP addresses for LAN connections. The boot IP address enables switch management when a PXM is in boot mode, which means that it has only loaded the boot software. The disk IP address enables switch management only after the switch has loaded and is running the runtime software.

A typical switch configuration requires either one or two IP addresses for LAN access. When the switch hosts a single PXM card, use just one IP address and assign it to both the boot and disk IP address options (more on this later in this section). When the switch uses two PXM cards, you can use one or two IP addresses. Figure 1-5 shows a redundant PXM configuration that uses two IP addresses. In a Cisco MGX 8850 (PXM1E/PXM45) or Cisco MGX 8950 switch, the redundant PXM cards would be in slots 7 and 8. In a Cisco MGX 8830 switch, the redundant PXM cards would be in slots 1 and 2.

Figure 1-5 Using Multiple IP Addresses for Switch Access



The configuration shown in Figure 1-5 provides the following results:

- Direct access to the active PXM using address B.B.B.B.
- Direct access to the standby PXM card using address A.A.A.A.
- The boot code on the standby PXM card can be upgraded without interrupting service on the active PXM card.
- You can perform additional procedures in backup boot mode on the standby card without interrupting the active card. These procedures include hard disk formats and file transfers.

When different IP addresses are used for the boot and disk IP addresses, you can manage the active PXM card and the switch using the disk IP address, which is B.B.B.B in Figure 1-5. You can also access the standby PXM card using the boot IP address. When the same address is used for both the boot and disk IP addresses, that address can be used only to manage the active PXM card.

When planning IP addresses for your switch, use the following guidelines:

- If the switch has one PXM, make the boot and disk IP addresses the same.
- If the switch has two PXM cards and you want to minimize the number of IP addresses used, set both boot IP addresses and the disk IP address to the same address.
- If the switch has two PXM cards and you want to maximize your control options from remote locations, assign the same boot IP address to each PXM card, and assign a different IP address to the disk IP address.
- Be sure to define the default gateway IP address when defining the boot IP addresses.
- To minimize router configuration, choose boot, LAN, and default gateway IP addresses that are all on the same subnet.

For instructions on setting boot and disk IP addresses, see the "Setting the LAN IP Addresses" section in Chapter 2, "Configuring General Switch Features."

Guidelines for Creating a Network Clock Source Plan

Clock synchronization in an ATM network is very important. If two switches have trouble synchronizing their communications, traffic between the switches may have excessive errors or line failures. MGX switches support two methods of network clock synchronization:

- manual
- Network Clock Distribution Protocol (NCDP)

Both of these methods of clock synchronization are described in the sections that follow.

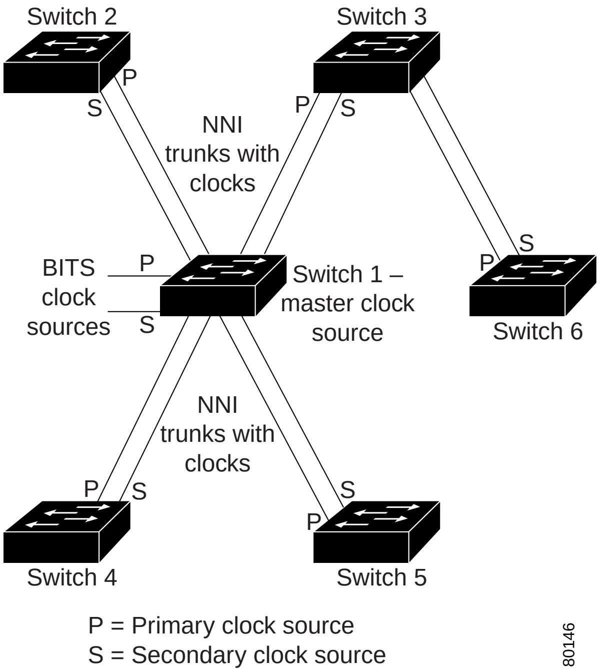
Note Manual clock configuration and NCDP configuration operate independently of one another. In other words, you can configure both versions of network clock sourcing on your network. However, only one version can be enabled at a time. You cannot run your manual network clock configuration on your network while NCDP is running, and vice-versa. However, both configurations are stored in the disk database. Therefore, if you disable NCDP, the network reverts back to your original manual network clock configuration. If you enable NCDP on that same network at a later point, the network will revert back to the previous NCDP configuration.

Note On Cisco MGX 8850 (PXM1E) and Cisco MGX 8830 switches, clock source configuration is done on the PXM1E card and passed to other nodes over PXM1E lines. On Cisco MGX 8850 (PXM45) and Cisco MGX 8950 switches, clock source configuration is done on a PXM45 card, and clock sourcing information is passed to other nodes over NNI trunks connected to service modules.

Planning for Manual Clock Synchronization

In manual clock source configurations, you need to configure a primary and secondary clock source, which are distributed throughout the network. All nodes have an internal Stratum-3 clock that serves as a tertiary clock source. The secondary clock source takes over if the primary clock source fails, and the tertiary clock source takes over if the secondary clock source fails. If no clock sources are configured, the switch uses the internal Stratum-3 clock source. If only a primary clock source is configured, the internal Stratum-3 clock takes over in the event of a primary clock source failure. Figure 1-6 shows an example network clock source topology.

Figure 1-6 Example Network Clock Source Topology with a Single Master Clock Source



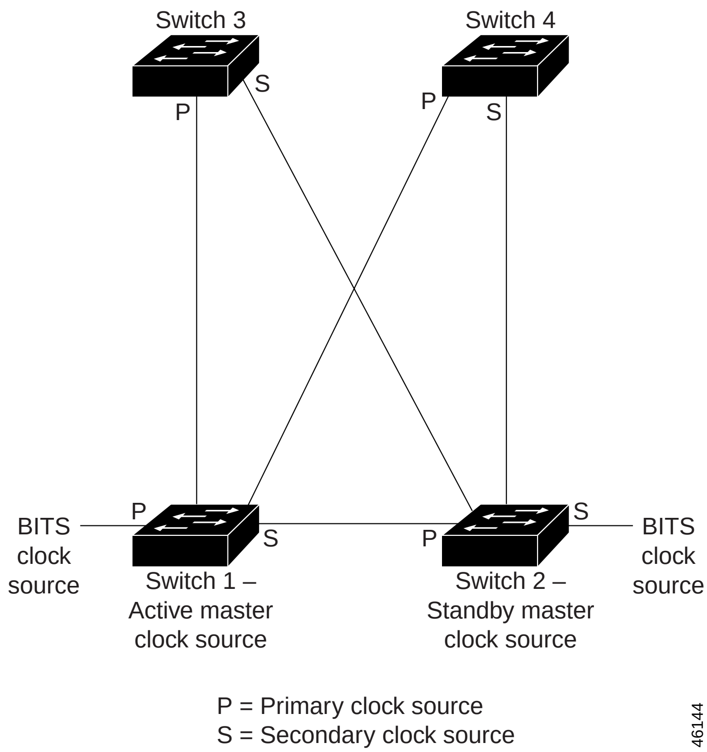
In Figure 1-6, Switch 1 provides the master network clock source to the rest of the network and uses highly accurate external Building Integrated Timing System (BITS) clock sources to time its transmissions. These BITS clock sources are T1 or E1 lines with Stratum-1, 2, or 3 clock signals. Switch 1 uses one BITS line as the primary clock source and uses the secondary BITS source only if a failure occurs on the primary BITS line. If both BITS sources fail, the internal Stratum-3 clock takes over.

Note The PXM45 and PXM1E cards support T1 data (1.544Mbps) and E1 data (2.048Mbps) clock sources; they do not support T1 or E1 sync clock sources. The PXM1 supports both T1 and E1 data types and an E1 sync (2.048MHz) line as a clock input.

Switches 2 through 5 synchronize to Switch 1 with the master clock signal, which they receive over NNI trunks. Switch 6 synchronizes its communications using the master clock source, which is forwarded from Switch 3. In this topology, all switches synchronize to the same clock source, and this configuration reduces the possibility that two switches might not be able to synchronize communications.

Figure 1-7 shows an example network clock source topology that uses master clock sources on different switches.

Figure 1-7 Example Network Clock Source Topology with Two Master Clock Sources



In Figure 1-7, Switches 1 and 2 have BITS devices. Switch 1 operates as the master and distributes its BITS clock source over NNI trunks to Switches 2 through 4. Switch 2 is the standby master and receives its primary clock signal over the NNI trunk from Switch 1. As long as Switch 1 and its primary BITS clock source are operating correctly, the entire network is synchronized to the BITS clock source from Switch 1.

In Figure 1-7, the secondary clock source for the network is the Switch 2 BITS clock source, and all other switches are configured to use the NNI trunks from Switch 2 as their secondary clock source. If Switch 1 or its BITS clock source fails, all the switches start using the clock signals from Switch 2 for network communications. This configuration preserves network sychronization when either a clock source or a switch fails.

When a clock source fails and recovers, there are a couple of ways that the switch can revert back to the recovered clock source. If the revertive option is enabled, the switch can automatically revert back to a recovered primary source from the secondary source. If failures cause the tertiary clock source (the internal Stratum-3 clock) to take over, the switch will revert to either a recovered primary or recovered secondary clock source.

Note Regardless of the setting of the revertive option, the switch does revert back to a recovered primary clock source if the secondary clock source fails. If the secondary clock source is functioning correctly and the switch configuration does not support an automatic return to a recovered primary clock source, you can manually switch back to the primary clock source by reconfiguring that clock source.

Note In releases prior to Release 5, the revertive option applied BITS clock sources and not to clock sources from trunks. Tertiary clock sources revert to a recovered primary or secondary clock in all releases.

To develop a network clock source plan, create a topology drawing and identify which switches serve as active and standby master clock sources. For each switch that receives clock sources from other switches, indicate the lines that carry the primary and secondary clock signals.

Consider the following information when you create your manual network clock source plan:

- Master clock sources that are located near the center of the network minimize clock signal propagation delay.
- BITS clock interfaces receive Stratum-3 or higher clock signals.
- Configuring a primary and secondary clock source provides fault tolerance.
- If both the primary and the secondary external clock sources fail, the switch uses an internal Stratum-3 clock.
- When using an external clock source and redundant PXM cards, use a Y-cable to connect that clock source to the same clock port on both PXM cards. Do not run separate external clock sources to each card as this can produce timing problems.
- If the switch is using its own internal Stratum-3 clock and a primary or secondary clock source recovers, the switch will use the recovered clock source.
- If no primary or secondary clock sources are configured, the switch uses the internal Stratum-3 clock.
- Primary and secondary BITS clocks can be configured after the switch is initialized. For more information, see the "Configuring Clock Sources" section in Chapter 2, "Configuring General Switch Features."
- Primary and secondary NNI trunk clocks must be configured after the cards and lines are configured. For more information on configuring a switch to use a clock source transmitted over a PXM1E line, see the "Configuring PXM1E Line Clock Sources" section in Chapter 3, "Provisioning PXM1E Communication Links." For more information on configuring a switch to use a clock source transmitted over a service module trunk, refer to the appropriate service module book. The service module books are listed in Table 1-1.

Planning for NCDP Synchronization

The MGX switches support a Network Clock Distribution Protocol (NCDP), which selects the best clock in your network based on your configuration, and automatically configures the path to that clock for each node throughout your network. In an NCDP clock configuration, there are no primary and secondary clock sources. Instead, you configure several clock sources for the nodes in your network, from which NCDP selects the best (or root) and second best clock source for the network. Once NCDP has selected the root clock source, it is propagated to all the nodes in the network so that all nodal clocks are synchronized. If the root clock source fails, the second best clock source becomes the root clock source. If the second best clock source fails, NCDP selects the third best clock source to take over as the root clock source, and so forth.

If you want to use NCDP to set up your network clocks, you must first enable NCDP, as described in the "Managing NCDP Clock Sources" section in Chapter 9, "Switch Operating Procedures." Once you enable NCDP on your node, it is automatically enabled on all NNI ports on the node. When NCDP is enabled, a root clock source is automatically selected and distributed to all nodes in the network that

have NCDP enabled. NCDP automatically selects an internal oscillator on one of the NCDP nodes to be the root clock source. Each NCDP node in the network is synchronized to this root clock reference. If you do not want the root clock source to be an internal oscillator, you can configure it to come from an external source with the **cnfncdpclksrc** command, as described in the “Managing NCDP Clock Sources” sectionChapter 9, “Switch Operating Procedures.”

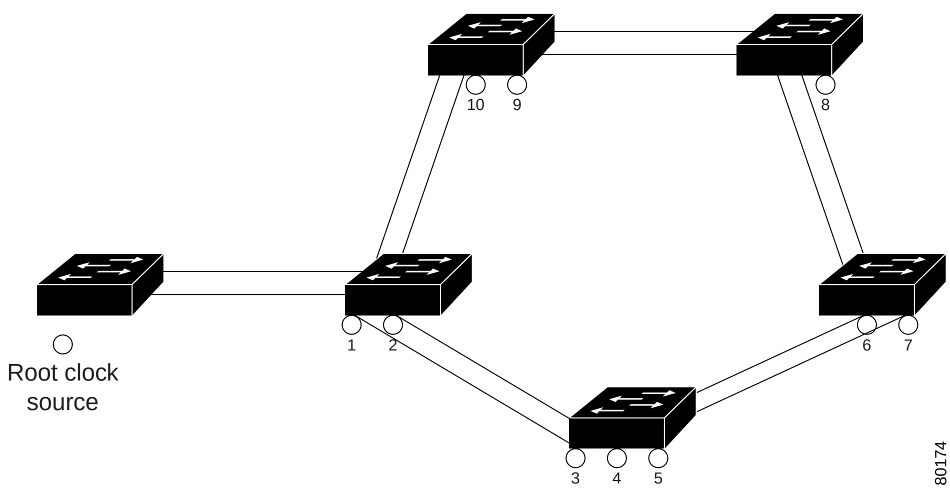
NCDP uses the following criteria to find the best root clock source for the network:

- Priority (should be sufficient to find the root)
- Stratum level (should be sufficient as a tie-breaker)
- Clock source reference
- ATM address of the switch

You can modify the clock priority, stratum level of the Bits source, and clock source reference through the **cnfncdpclksrc** command, as described in the “Managing NCDP Clock Sources” section in Chapter 9, “Switch Operating Procedures.”

Figure 1-8 shows an example NCDP network clock source topology. The numbers represent the priority of each network clock source, with 1 being the highest priority (or second best clock source) and 10 being the lowest priority. In this example, if the root clock source fails, the clock source with priority 1 takes over as the root clock. If the new root clock source with priority 1 fails, then the clock source with priority 2 takes over as the root, and so forth.

Figure 1-8 Example NCDP Source Topology



Consider the following information when you create your NCDP network clock source plan:

- You must enable NCDP on a per-node basis because manual clocking is the default method of clock synchronization.
- Clock sources that are located near the center of the network minimize clock signal propagation delay.
- Once you enable NCDP, it is enabled on all NNI ports on the local switch by default. This includes PNNI ports, IISP ports, and AINI ports.
- NCDP is disabled on virtual trunks by default.
- You can add clock sources to any UNI or clocking ports on the node.

- On every port with NCDP enabled, NCDP establishes a control VC to carry configuration and network topology information between the connected nodes. On non-virtual trunks, the control VC is established by default on VPI 0, VCI 34. If you change the VPI/VCI within the limits of the minimum or maximum range, then the control VC will be established on the new VPI/VCI.
- BITS clock interfaces receive Stratum-3 or higher clock signals.
- NCDP supports a maximum of 200 nodes in an NCDP domain. If your network has more than 200 nodes, multiple, smaller NCDP domains should be established. Typically, NCDP domains follow PNNI peer group boundaries.
- When using an external clock source and redundant PXM cards, use a Y-cable to connect that clock source to the same clock port on both PXM cards. Do not run separate external clock sources to each card because this can produce timing problems.
- If a failed clock source recovers, the switch will not revert to the recovered clock source unless you re-add it to the node with the **cnfncdpclksrc** command.
- Primary and secondary BITS clocks can be configured after the switch is initialized. For more information, see the "Configuring Clock Sources" section in Chapter 2, "Configuring General Switch Features."

To develop an NCDP network clock source plan, create a topology drawing and identify all the configured clock sources on each switch in the network. Identify the priority of each clock source. You may also want to identify any NNI ports where you plan to disable NCDP.

Configuring General Switch Features

This chapter describes how to set up general switch features that apply to multiple switch interfaces, beginning with a configuration quickstart procedure, which introduces the configuration tasks. The following sections provided detailed information on how to complete the configuration tasks.

Before you begin this chapter, keep the following statements in mind:

- The generic term “PXM” refers to both the PXM1E and the PXM45. If a procedure or step is specific to one of these cards, it will be called out in the text.
- The generic term “MGX” refers to the Cisco MGX 8830, Cisco MGX 8850 (PXM1E/PXM45), and Cisco MGX 8950 switches and the Cisco MGX 8880 Media Gateway. If a procedure or step is specific to only one or two of these MGX switches, it will be called out in the text.
- The procedures in this section apply to the Cisco MGX 8830, Cisco MGX 8850 (PXM1E/PXM45), and Cisco MGX 8950 switches and the Cisco MGX 8880 Media Gateway. The PXM examples show a Cisco MGX 8850 switch, but you can apply these examples to other switches. If an example does not apply to one of the three MGX switches, it will be called out in the text.

Configuration Quickstart

The quickstart procedure is provided as an overview and as a quick reference for those who have already configured MGX switches.

	Command	Purpose
Step 1	**sysVersionSet** *version* **reboot**	Select the runtime firmware version the switch will use on the PXM card and restart the switch with that firmware. For example: `sysVersionSet "004.000.000.000"` **Note** These commands must be entered at the PXM backup boot prompt. On PXM1E cards, the backup boot prompt is pxm1ebkup>. On PXM45 cards, the backup boot prompt is pxm45bkup>. See the "Initializing the Switch" section later in this chapter.
Step 2	After you reboot, the system prompts you to enter your *username* and *password*.	Start a management session. For instructions on starting a session from a terminal or workstation attached to the Console Port (CP), see the "Starting a CLI Management Session After Initialization" section later in this chapter. For information on other ways to manage a switch, see Appendix C, "Supporting and Using Additional CLI Access Options." **Note** To perform all the procedures in this quickstart procedure, you must log in as a user with SERVICE_GP privileges. The default user with these privileges is *service* and the default password is *serviceuser*. For more information on access privileges, see the "Configuring User Access" section later in this chapter.
Step 3	**adduser** *<username>* *<accessLevel>* Related commands: **cnfpasswd** **cnfuser** *<options>* **deluser** *<username>*	Configure user access. This step is optional. See the "Configuring User Access" section later in this chapter.
Step 4	**cnfname** *<node name>*	Configure the switch name. See the "Setting and Viewing the Node Name" section later in this chapter.
Step 5	**cnfdate** *<mm:dd:yyyy>* **cnftmzn** *<timezone>* **cnftmzngmt** *<timeoffsetGMT>* **cnftime** *<hh:mm:ss>* Related commands: **dspdate**	Configure the switch time. See the "Viewing and Setting the Switch Date and Time"section later in this chapter.

	Command	Purpose
Step 6	**addcontroller** <*options*> **cnfpnni-node** <*options*> **cnfspvcprfx** <*options*> Related commands: **dspcontrollers** **dspspvcprfx** **dsppnni-summary-addr**	Configure basic PNNI node parameters which include the PNNI controller, PNNI level, peer group ID, ATM address, node ID, and SPVC prefix. See the "Configuring PNNI Node Parameters" section later in this chapter.
Step 7	**addcontroller** <*options*> Related commands: **dspcontrollers**	Configure the MPLS controller. See the "Configuring the MPLS Controller" section later in this chapter. **Note** The MPLS label switch controller (LSC) function is not supported on Cisco MGX 8850 (PXM1E) or Cisco MGX 8830 switches.
Step 8	**cnfclksrc** <*options*> or **cnfncdp**	Configure any BITS clock ports the switch will use. You can configure clock sources manually or through the NCDP feature. This step is optional. **Note** Each switch supports one clock source. That clock source can reside on a PXM1E, AXSM, CESM, VISM-PR, or AUSM card. See the "Configuring Clock Sources" section later in this chapter. **Note** For information on configuring PXM1E line clock sources, see the "Configuring PXM1E Line Clock Sources" section in Chapter 3, "Provisioning PXM1E Communication Links." For information on configuring AXSM line clock sources, see the *Cisco ATM Services (AXSM) Configuration Guide and Command Reference for MGX Switches, Release 5*.
Step 9	**bootChange** **ipifconfig** <*options*>	Set the IP address or addresses for LAN access. See the "Setting the LAN IP Addresses" section later in this chapter.
Step 10	**cnfsnmp** community [*string*] **cnfsnmp** contact [*string*] **cnfsnmp** location [*string*] Related commands: **dspsnmp**	Configure SNMP management. See the "Configuring for Network Management" section later in this chapter.
Step 11	**dspcds** **dspcd** **cc** <*slotnumber*>	Verify the hardware configuration. See the "Verifying the Hardware Configuration" section later in this chapter.

Initializing the Switch

After you assemble a new switch, as described in the *Cisco MGX 8850 (PXM1E/PXM45), Cisco MGX 8950, Cisco MGX 8830, and Cisco MGX 8880 Hardware Installation Guide, Releases 2 Through 5*, you must initialize the switch before you can configure it. Although PXM cards ship with the latest version of boot firmware on the front card, the runtime firmware cannot be loaded until both front and back cards have been installed. When you initialize the switch, you are configuring the switch to load a specific runtime firmware version from the PXM hard disk.

A new switch must be initialized using a console port management session. A console port management session requires a terminal or workstation with a serial connection to the Console Port (CP) port on the PXMUI-S3 back card. Figure 2-1 shows how a workstation connects to a PXM45 UI-S3 back card. Figure 2-2 shows how a workstation connects to a PXM1E UI-S3/B back card.

Note Note that some or all of the commands discussed in this section require SERVICE_GP or CISCO_GP privileges. These privileges and the default user names and passwords for these privilege levels are described in the "Adding Users" section, which appears later in this chapter.

Figure 2-1 Workstation Connection to Console Port on a PXM-UI-S3 Back Card

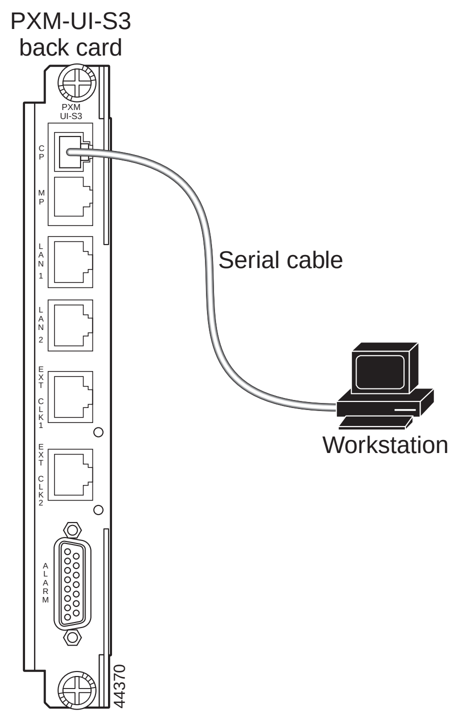
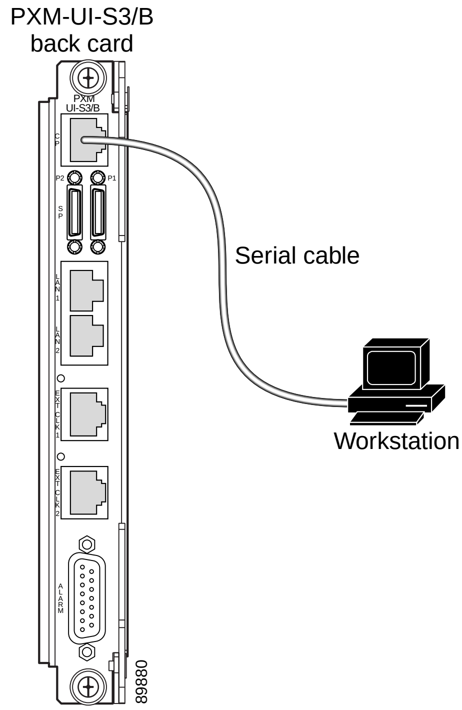


Figure 2-2 Workstation Connection to Console Port on a PXM-UI-S3/B Back Card



To initialize the switch, use the following procedure.

Step 1 Physically connect a terminal or workstation to the PXM UI-S3 or PXM-UI-S3/B back card as shown in Figure 2-1 or Figure 2-2. You can use any personal computer or UNIX workstation with VT-100 emulation software.

> **Note** You can connect the terminal to a PXM in either slot 7 or slot 8 in the Cisco MGX 8850 (PXM1E/PXM45) or in the Cisco MGX 8950. On a Cisco MGX 8830, connect the terminal to a PXM1E in either slot 1 or slot 2.

Step 2 Start the terminal or, if you are using a workstation, start a terminal emulation program and configure it to connect to the switch through the serial port on the workstation. For instructions on configuring the terminal emulation program, refer to the documentation for the emulation program.

The default switch configuration supports the following settings: 9600 bps, 8 data bits, no parity, 1 stop bit, no hardware flow control.

Step 3 At the workstation, enter the command that connects the terminal emulation program to another computer.

Step 4 If the switch power is not on, turn on the switch power as described in the *Cisco MGX 8850 (PXM1E/PXM45), Cisco MGX 8950, Cisco MGX 8830, and Cisco MGX 8880 Hardware Installation Guide, Releases 2 Through 5*.

> **Note** You can connect the workstation to the switch before or after power is applied. If you start the terminal emulation program before turning on the switch, the terminal emulation program displays the switch startup messages.

Step 5 If the switch does not display any messages or a prompt, press **Return**.

When startup is complete for an uninitialized switch, it will display the PXM backup boot prompt.

```
PXMbkup>
```

Step 6 Locate and write down the version number for the runtime firmware provided with your switch. You need this version number to complete the next step.

The version number is listed in the following release note documents:

- *Release Notes for Cisco MGX 8850 (PXM1E/PXM45), Cisco MGX 8950, and Cisco MGX 8830 Switches, Release 5.0.00*
- *Release Notes for the Cisco MGX 8880 Media Gateway, Release 5.0.00*

You must use the same format listed in the firmware file name when you enter the number. For example, if the firmware filename is pxm1e_004.000.000.000_mgx.fw, the firmware version number you will enter is 004.000.000.000.

Step 7 When the PXM backup boot prompt appears, define the PXM runtime firmware version by entering the **sysVersionSet** command as follows:

```
PXMbkup> sysVersionSet version
```

Replace *version* with the version number for the runtime firmware. For example:

```
PXMbkup> sysVersionSet 005.000.001.000
```

Step 8 Reboot the switch by entering the **reboot** command as follows:

```
PXMbkup> reboot
```

During initialization, the switch will appear to boot twice. When the reboot is complete, the switch displays the Login prompt, which indicates that the firmware is loaded and the switch is ready for configuration.

Tip The **sysVersionSet** command has failed if the switch reboot process stops and displays the message "`Can not open file C:/version`" or the message "`Unable to determine size of C:/FW/filename`." If this happens, press **Return** to display the backup boot prompt, then refer to the "Troubleshooting Upgrade Problems" section in Appendix A, "Downloading and Installing Software Upgrades."

Step 9 To log in to the switch, enter the login name supplied with your switch, then enter the password for that login name. For example:

```
Login: cisco
password:

unknown.7.PXM.a >
```

Note The default user names and passwords for all privilege levels are described in the "Adding Users" section, which appears later in this chapter.

Note If the switch has not fully started and is operating in init state (which is also called stage 1 CLI mode), an i appears in the switch prompt: unknown.7.PXM.i>. In this mode, you can only log in as user *cisco*, password *cisco*, and a limited set of commands are available for troubleshooting. If you log in during init state and the card progresses to the active or standby state, the card will log out the init state user and prompt you to log in again. At this point, you can log in as a configured user with the corresponding password.

Note On Cisco MGX 8850 (PXM1E/PXM45) and Cisco MGX 8950 switches, the number 7 in the switch prompt indicates that you are managing the PXM in slot 7. If you are managing the PXM in slot 8, the switch prompt displays the number 8.

On a Cisco MGX 8830 switch, the number 1 in the switch prompt indicates that you are managing the PXM in slot 1. If you are managing the PXM in slot 2, the switch prompt displays the number 2.

The switch does not display the password during login. When login is complete, the switch prompt appears.

The switch prompt for the PXM cards and for all service modules uses the following format:

```
nodename.slot.cardtype.state>
```

Table 2-1 describes the components in the CLI prompt.

Table 2-1 CLI Prompt Components

Component	Description
nodename	The *nodename* is the name of the node. When a new switch starts up, the node name is set to *unknown*. To change the name, see the "Setting and Viewing the Node Name" section which appears later in this chapter.
slot	The *slot* number indicates the physical slot in which the card you are configuring is installed. For most switch configuration procedures, configure the switch using the PXM cards. On Cisco MGX 8850 (PXM1E/PXM45) and Cisco MGX 8950, the PXM cards are in slots 7 and 8. In Cisco MGX 8830, the PXM cards are in slots 1 and 2. For many line and trunk configuration procedures, you need to modify service modules (such as the CESM card), which are installed in the other slots.
cardtype	The *cardtype* identifies the model of the card, such as PXM or CESM.
state	The card *state* is active (a), standby (s), or init (i). Cards are labeled as *init* while they are initializing during switch startup.

Note The prompt for FRSM-2CT3 cards displays VHS2-CT3 as the cardtype, because the FRSM-2CT3 is a VHS card. For example: `MGX.1.4.VHS2CT3.a >`. FRSM 8T1E1 cards, however, follow the standard naming convention and display FRSM as the cardtype in the switch prompt.

After initialization, the PXM in the initialized slot becomes active. If a second PXM resides in the other slot, the active PXM initiates a runtime firmware load on the other slot. After the runtime firmware loads on the nonactive PXM, the card enters standby mode, ready to take control if the active card fails.

After you log in, the switch maintains your session for the default period of 10 minutes (600 seconds) after the last keystroke is entered. If the session is idle longer than 600 seconds, the session is terminated.

Tip To restart an automatically terminated session, press **Return**. The switch will prompt you for a login name and password.

Step 10 To change the session time-out period, enter the **timeout** command as follows:

```
unknown.7.PXM.a > timeout <seconds>
```

Replace *seconds* with the number of seconds you want the session to remain active before it times out. The maximum value is 600. To disable time-out in releases prior to Release 5, enter 0 seconds. For Release 5 and later, entering 0 will set the default time to 43200 seconds (12 hours). The switch uses the new timeout value until you terminate the session. Each time a new session is started, the timout value returns to the default value, 600 seconds.

Once you have completed the procedure above, you have established a command line interface (CLI) management session. You can use a CLI management session to configure or monitor the switch.

Starting a CLI Management Session After Initialization

After initialization, you can terminate and start sessions at any time using the terminal or workstation connection to the CP port, which was described in the previous section.

Tip The switch also supports several other types of management connections, including remote connections. For instructions on supporting and starting other types of CLI management sessions, see Appendix C, "Supporting and Using Additional CLI Access Options."

Note Some or all of the commands discussed in this section require service-level or above user privileges. To access these commands, you must have debug (Service or Cisco level) privileges and passwords.

To start a CLI management session at the CP port for switch configuration and monitoring, use the following procedure.

Step 1 Turn on the terminal or start the terminal session.

For instructions on preparing the terminal and the connection, refer to the previous section, "Initializing the Switch."

Step 2 If the `Login` prompt does not appear, press **Return**. The `Login` prompt comes from the switch and indicates that the terminal has successfully connected to the switch.

Step 3 When the `Login` prompt appears, enter the login name supplied with your switch, then enter the password for that login name. For example:

```
Login: superuser
password:
unknown.7.PXM.a >
```

Note The default configured username and password sets are: user cisco, password *cisco;* user service, password *serviceuser;* and user superuser, password *superuser.* To perform most of the procedures in this chapter, you will need to login as a user with SUPER_GP privileges or higher. The default username with these privileges is *superuser.*

Note If the switch has not fully started and is operating in init state (which is also called stage 1 CLI mode), an i appears in the switch prompt: unknown.7.PXM.i>. In this mode, you can only log in as user *cisco*, password *cisco*, and a limited set of commands are available for troubleshooting. If you log in during init state and the card progresses to the active or standby state, the card will log out the init state user and prompt you to log in again. At this point, you can log in as a configured user with the corresponding password.

The switch does not display the password during login. When login is complete, the switch prompt appears.

The switch prompt for PXM cards and for all service modules uses the following format:

nodename.slot.cardtype.state>

Table 2-1 describes the components in the switch prompt.

Note The switch prompt for FRSM-2CT3 cards uses a different card name in the prompt. This is to distinguish FRSM-2CT3 cards from FRSM-8T1 cards. The FRSM-2CT3 cards use the name *VHS2CT3* in the place for *cardtype*. FRSM-8T1 card use the standard naming convention and display *FRSM* in the place for *cardtype*.

After you log in, the switch maintains your session for 10 minutes (600 seconds) after the last keystroke is entered. If the session is idle longer than 600 seconds, the session is terminated.

Tip To restart an automatically terminated session, press **Return**. Depending on the application you use to log in to the switch, you may be prompted for a login name and password.

Step 4 To change the session time-out period, enter the **timeout** command as follows:

```
unknown.7.PXM.a > timeout <seconds>
```

Replace *seconds* with the number of seconds you want the session to remain active before it times out. The maximum value is 600. To disable timeout, enter 0 seconds. The switch uses the new timeout value until you terminate the session. Each time a new session is started, the timeout value returns to the default value, 600 seconds.

Once you have completed the procedure above, you have established a CLI management session. You can use a CLI management session to configure or monitor the switch.

Ending a CLI Management Session

CLI management sessions automatically terminate after the configured idle time. The default idle time is 600 seconds (10 minutes) and can be changed with the **timeout** command. To manually end a CLI management session, enter the **bye** or **exit** command.

Note The **bye** and **exit** commands end the CLI session. They do not terminate the terminal session. For instructions on terminating the terminal session, refer to the manuals for your terminal or terminal emulation program.

To restart the session after entering the **bye** or **exit** command, press **Return**, and the switch will prompt you for a username and password.

Entering Commands at the Switch Prompt

The commands in the switch operating system are associated with the cards that are installed in the switch. Before you execute a command, you must select a card that supports the command. The switch displays the currently selected card in the switch prompt. For example, the following switch prompt shows that the PXM card in slot 7 is selected:

```
mgx8850a.7.PXM.a>
```

To select another card in the switch, enter the **cc** command:

```
mgx8850a.7.PXM.a> cc <slotnumber>
```

Replace *slotnumber* with the slot number of the card you want to manage. You can use the **dspcds** command to list which slot numbers are occupied. Table 2-9 lists the valid slot numbers for each card type.

After you execute the **cc** command to change cards, verify that you are managing the correct card by viewing the slot number that is shown in the switch prompt. The following example shows the prompt for a CESM card in slot 6 of a Cisco MGX 8850 switch:

```
mgx8850a.6.CESM.a >
```

If you have trouble entering a command, look at the switch prompt to see if you have selected the correct card and type for the command. The following example shows the response to an unrecognized command:

```
mgx8850a.6.CESM.a > dspdate
Unknown Command: dspdate
```

The **dspdate** command runs on a PXM card. It is not recognized by a CESM card.

Tip The command examples in this book include the switch prompt so that you can verify which card types support specific commands.

The default switch configuration allows you to enter command abbreviations on PXM cards and most service modules. Because the **help** command is the only command that begins with **he**, you can use the abbreviated **he** command to display help. The following example demonstrates that the switch recognizes your partial entry of the **help** command because it proceeds to list commands.

```
mgx8850a.7.PXM.a> he

    Available commands
    ------------------
    addpref
    addprfx
    addred
    addrscprtn
    addsct
    addserialif
    addslave
    addsntprmtsvr
    addtrapmgr
    adduser
    aesa_ping
    arpAdd
    arpDelete
    arpFlush
    arpShow
    bootChange
    burnboot
    bye
    cc

Type <CR> to continue, Q<CR> to stop:
```

Note The command abbreviation feature is not supported on older cards such as AUSM, CESM, and FRSM.

Tip To disable the command abbreviation feature, enter the **cnfcmdabbr** command. To display the current setting for this option, enter the **dspcmdabbr** command.

Notice the last line of the help command display. Because the **help** display is too long to appear on one screen, it is displayed in pages. Press **Return** to display the next page, or type **q** and press **Return** to cancel the **help** display.

The following example demonstrates what can appear when a command abbreviation is entered and either the abbreviation is not unique or the card does not support abbreviations:

```
M8830_CH.1.13.AUSMB8.a > dspc

Unknown Command : dspc

The possibilities are :

dspcacparm              dspcd                   dspcderrs
dspcdparms              dspchan                 dspchancnt
dspchans                dspcon                  dspcons
dspconstdabr
```

In the example above, **dspc** is entered at an AUSM card prompt. Because there are several possible commands that start with **dspc**, the switch lists all supported commands that start with those letters. AUSM cards are older cards. Newer cards such as the PXM45 produce a different display for the same scenario:

```
M8850_LA.8.PXM.a > dspc
ERR: ambiguous command: "dspc"
```

For newer cards, you can display a list of commands that start with the same prefix by entering the command as follows:

```
M8850_LA.8.PXM.a > ? dspc

    Available commands
    ------------------
    dspcausecnt
    dspcbclk
    dspcd
    dspcdalms
    dspcderrs
    dspcdhealth
    dspcds
    dspcdstatus
    dspcduptime
    dspcdvtdft
    dspchassis
    dspcli
    dspclkalms
    dspclkparms
    dspclksrcs
    dspcmdabbr
    dspcon
    dspconinfo
    dspconntracebuffer

Type <CR> to continue, Q<CR> to stop:
```

Whenever the switch displays an error message, be sure to check the spelling of the command, the parameters entered with the command, and the prompt at which the command was entered.

Getting Command Help

The following sections describe how to display the following types of command help:

- Available commands
- Available commands with additional information on access levels and logging
- Command syntax and parameters

Displaying Command Lists

The commands you can use to manage the switch are determined by your user name, which is configured for a particular access level. User names and access levels are described in more detail in the "Configuring User Access" section later in this chapter. To display a list of all the commands available to the username you used at log in, enter the **help** command as follows:

```
mgx8850a.7.PXM.a> help
```

To display a list of commands that include a common set of characters, enter a question mark and the common set of characters, as shown in the following example:

```
M8850_LA.8.PXM.a > ? ip

    Available commands
    ------------------
    cnfifip
    cnfilmiproto
    cnftrapip
    delifip
    dspifip
    dspipconntask
    dspipif
    dspipifcache
    dsptrapip
    ipifconfig
    pntracevsipkt
    setipconndebug
    zip

M8850_LA.8.PXM.a >
```

Displaying Detailed Command Lists

Detailed command lists display the following additional information for each command:

- Access level required to enter the command
- Card state in which the command can be entered
- Whether command execution is logged

Note To display detailed command lists, you must establish a session using a username with SERVICE_GP privileges or higher (access privileges are described later in this chapter in the "Configuring User Access" section). You can also find this information in the *Cisco MGX 8850 (PXM45/PXM1E), Cisco MGX 8950, Cisco MGX 8830, and Cisco MGX 8880 Command Reference, Release 5*.

To enable detailed command lists, log in as a user at the CISCO_GP level and enter the **clidbxlevel** command as shown in the following example:

```
mgx8850a.7.PXM.a> clidbxlevel 1
Value of cliDbxLevel is now 1
```

Note Beginning with Release 5, the **clidbxlevel** command is not available in the default configuration. To enable access to this command, log in as a user at the CISCO_GP level and enter the **seteng on** command. The **seteng** command enables and disables (**seteng off**) access to commands that are intended for use by Cisco engineers.

After you enter this command, you can display detailed command lists by entering the **help** command as shown in the following example:

```
mgx8850a.7.PXM.a> ?

    Command          Access           Card         Log
    ---------------------------------------------------
    ?                ANYUSER          A|S|I          -
    abortallsaves    GROUP1           A              +
    abortofflinediag SERVICE_GP       A|S            -
    abortrev         SERVICE_GP       A|S            +
    actaudit         SUPER_GP         A              +
    addaddr          GROUP1           A              +
    addapsln         GROUP1           A              +
    addcon           GROUP1           A              +
    addcontroller    SUPER_GP         A              +
    addfltset        GROUP1           A              +
    addlink          ANYUSER          A              -
    addlnloop        GROUP1           A              +
    addlpback        GROUP1           A              -
    addmaster        GROUP1           A              +
    addpart          GROUP1           A              +
    addpnni-node     SUPER_GP         A              +
    addpnni-summary-addr SUPER_GP         A              +
    addpnport        GROUP1           A              +
    addport          GROUP1           A              +

Type <CR> to continue, Q<CR> to stop:
```

Note After you enter the **clidbxlevel** command, the **help** command displays detailed reports for that session only. You can disable detailed reports by entering the **clidbxlevel 0** command. Every time you start a new session, detailed command lists are disabled.

The Access column shows the access level required to enter the command. Access levels are described in the “Configuring User Access” section later in this chapter.

The Card State column identifies the card states during which the command can be executed. Valid card states are active, standby, and init. Cards are labeled as *init* during switch startup. The options that appear in the Card State column are described in Table 2-2.

If a plus symbol appears in the Log column, each successful execution of the command is logged. If a minus symbol appears in the column, the command is not logged.

Table 2-2 Card State Descriptions

Card State	Description
A	Command is supported when the card state is active.
I	Command is supported when the card state is in init state.
S	Command is supported in standby state.

Displaying Command Syntax and Parameters

To display the syntax of a command, enter the command without any parameters. The following example shows the syntax report provided by the switch when the **cnfifip** command is entered without any parameters.

```
M8850_LA.8.PXM.a > cnfifip
Syntax: cnfifip <interface> <ip_address> [<mask> [<broad_addr>]]
                   OR
        cnfifip <interface> <flag>
   interface -- 26/28/37 (26:Ethernet 28:SLIP 37:ATM) or Ethernet/SLIP/ATM
   ip_address -- <n>.<n>.<n>.<n> (<n>: integer 0..255)
   mask -- subnet mask <n>.<n>.<n>.<n> (<n>: integer 0..255)
   broad_addr -- <n>.<n>.<n>.<n> (<n>: integer 0..255)
   flag -- a string "UP" or "DOWN"
```

When a parameter is shown between less-than (<) and greater-than (>) symbols, the parameter represents a variable that must be replaced by a value. The values are described below the command syntax.

When the parameter is shown between brackets ([]), it is an optional parameter. If you omit an optional parameter, most commands will use the last value defined for the option. If no value has been assigned to an option, the default value is used.

Note Some commands, such as **dspcd** and **saveallcnf**, do not require parameters, so entering the command without parameters executes the command.When you enter the **saveallcnf** command, which saves the current switch configuration to a file, the switch prompts you to confirm the save before execution begins. Whenever the switch prompts you to confirm a command, the command you are confirming is likely to change the switch configuration, reduce switch performance, or take a long time to execute.

Tip To see the syntax of a command that does not require parameters, enter the command with a parameter you know is incorrect. For example:

```
mgx8850a.7.PXM.a> dspcd jim
ERR: Invalid Slot number specified
ERR: Syntax: dspcd ["slot_number"]
        slot number -- optional;
```

Configuring User Access

The usernames and passwords supplied with your switch provide access to all switch features, and they allow you to add and delete users and change user passwords.

When configuring user access for the switch, consider the following recommendations:

- Change the default passwords provided with your switch. These passwords are published on the Cisco website and enable anyone with local or remote network access to configure and manage your switch.
- Share the user names and passwords with only one or two people.

- If usernames and passwords become common knowledge during the switch installation and configuration, change the passwords.
- If additional users need access to the switch, create usernames and passwords below the top levels so that these users cannot access or modify the top-level user information.

The following sections describe how to add users, change passwords for existing users, delete users, and recover the user *cisco* password.

Adding Users

The Cisco MGX switches support up to 100 users. To create a user account, specify the following information:

- user name
- password
- access level

The user name and password identify the user and determine the user access level for switch management.

An access level must be assigned to a user when the user is added to the switch. The access levels listed in Table 2-3 are used throughout this guide to indicate the level of access required to execute a command or complete a procedure. These access levels are also called access privileges. If a user has access privileges at a lower level than a command requires, the user cannot execute the command. If the user has access privileges at the level required or at a higher level, the user can execute the command.

Table 2-3 User Access Levels

Access Level	Descriptions
CISCO_GP	This is the highest user access level. Users with this access level have complete access to all commands. There is only one user at the CISCO_GP level, and that username is *cisco*. The default password for user *cisco* is *cisco*. Again, Cisco Systems recommends that you change the default passwords when you install a switch. Users at the CISCO_GP access level can add users, delete users, change passwords, and change access levels for users at the following levels: SERVICE_GP, SUPER_GP, GROUP1, and ANYUSER.
SERVICE_GP	This access level allows access to commands that update switch firmware, save and restore the switch configuration, and enable debugging. This access level also provides access to all commands in all lower access levels: SUPER_GP, GROUP1, and ANYUSER. The default username is *service*. The default password is *serviceuser*. Users at the service access level can add users, delete users, change passwords, and change access levels for users at the following levels: SUPER_GP, GROUP1, and ANYUSER.

Table 2-3 User Access Levels (continued)

Access Level	Descriptions
SUPER_GP	This access level allows users to configure switch level parameters such as the node name, date, and interface IP addresses. Users at this level can also enable traces. This access level also provides access to all commands in all lower access levels: GROUP1 and ANYUSER. The default username is *superuser*, and the default password is *superuser*. Users at the superuser access level can add users, delete users, change passwords, and change access levels for users at the following levels: GROUP1 and ANYUSER.
GROUP1	This access level allows users to configure line and port level parameters and create SPVCs[1] and SPVPs[1]. This access level also provides access to all commands at the ANYUSER access level. No default username and password is provided for this access level. Users at the GROUP1 access level can add users, delete users, and change passwords for users at the ANYUSER access level.
ANYUSER	This access level allows users to run display and status commands that display the switch configuration and operational status. No default username and password is provided for this access level.

1. SPVC = soft permanent virtual connection
2. SPVP = soft permanent virtual path

Note Earlier releases of the Cisco MGX 8850 software support users at levels Group 2 through Group 5. These user levels have been removed from the software. If you upgrade a switch that has users configured at these levels, the user level for the affected users will change to Group 1 level access during the upgrade.

To add a user to the switch, use the following procedure.

Step 1 Establish a CLI management session with GROUP1 privileges or higher. To add a user at a specific access level, you must log in as a user with a higher access level.

Step 2 Enter the following command after the switch prompt:

```
mgx8850a.7.PXM.a> adduser <username> <accessLevel>
```

Enter the *username* using 1 to 12 alphanumeric characters. Specify the access level by entering one of the levels defined in Table 2-3.

Note The access levels are case-sensitive and must be entered as shown in Table 2-3. Also, you cannot add users at access levels that are equal to or above your own access level.

If you enter the command correctly, the switch prompts you for a password.

Step 3 Enter a password, using 5 to 15 characters.

Step 4 When prompted, enter the password a second time to validate the previous entry.

This completes the addition of the new user.

Step 5 To display the new user in a list of all users, enter the **dspusers** command.

Tip To determine which commands are available at a particular access level, log in to the switch as a user at that access level, then enter the **help** or **?** command.

Step 6 To test the username, enter the **bye** command, then log in as the new user.

Tip If you forget which username you used to log in, enter the **whoami** command. This command displays the username, access level, and access method (for example, Telnet) for the current session.

Changing Your Own User Password

To change your own password with the **cnfpasswd** command, use the following procedure.

Note The **cnfuser** command allows you to change another user password if you have the correct access privileges. The next section describes how to use the **cnfuser** command.

Step 1 Log in to your user account with the username for which you want to change the password.

Step 2 Enter the following command after the switch prompt:

```
mgx8850a.7.PXM.a>cnfpasswd
```

Step 3 When prompted, enter your current password.

Step 4 When prompted, enter a new password, using 5 to 15 characters.

Step 5 When prompted, enter the new password a second time to validate the correct entry.

This completes the change of password.

Step 6 To test the new password, enter the **bye** command, then log in using the new password.

Changing User Access Levels and Passwords with cnfuser

After you create a user, you can change that user's access level or password using the **cnfuser** command.

Note To change your own user password, enter the **cnfpasswd** command as described in the preceding section.

To change the user level or password of a switch user, use the following procedure.

Step 1 Log in to the switch. Use either the username for which you want to change the password, or a username with privileges at least one level higher than those of the user whose password you want to change.

Step 2 Enter the following command after the switch prompt:

```
mgx8850a.7.PXM.a> cnfuser -u <username> [-p] [-l <accessLevel>]
```

Replace *username* with the name of the user for whom you are making the change.

If you are changing the password, specify the **-p** option. After you enter the command, the switch prompts you to enter the new password as shown in the following example:

```
M8850_LA.8.PXM.a > cnfuser -u jim -p
Enter new password:
Re-enter new password:
Completed local database changes for user jim
```

If you are changing the user access level, specify the **-l** (lowercase L) option and enter the appropriate access level as shown in Table 2-3. In the following example, the access level is changed for user *jim*:

```
M8850_LA.8.PXM.a > cnfuser -u jim -l SUPER_GP
Completed local database changes for user jim
```

Note You can change passwords and access levels only for users who have privileges lower than the username you used to log in.

Step 3 To test a new password, enter the **bye** command, then log in using the new password.

Step 4 To verify a user access level change, enter the **dspusers** command.

The **dspusers** command displays all the usernames and the access level for each user as shown in the following example:

```
mgx8850a.7.PXM.a> dspusers

    UserId        AccessLevel
    -------------------------
    cisco         CISCO_GP
    service       SERVICE_GP
    superuser     SUPER_GP
    jbowman       GROUP1
```

Deleting Users

To delete a user, use the following procedure.

Step 1 Establish a CLI management session using a username with privileges at least one level higher than that of the user you want to delete.

Step 2 Enter the following command after the switch prompt:

```
mgx8850a.7.PXM.a> deluser <username>
```

Enter the *username* using from 1 to 12 alphanumeric characters. This completes the deletion of a user.

Step 3 To verify the user has been deleted, enter the **dspusers** command.

Resetting the User *cisco* Password

If you lose or forget your password for switch access, you should ask a user with a higher access level to reset your password using the **cnfuser** command. If you do not have any passwords for any access levels, you can use the following password recovery procedure to reset the password for user *cisco*. This procedure resets the user cisco password to *cisco* and leaves all other passwords unchanged. (You can change the other passwords with the **cnfuser** command after logging in as user cisco.)

Note This feature can be disabled using the **cnfpswdreset** command as described in the next section. You can determine if this feature is enabled or disabled by logging in as a user at any level and entering the **dsppswdreset** command.

Use the following procedure to reset the user *cisco password*.

Step 1 Establish a physical connection to the switch through the Console Port (CP) connector on the PXM-UI-S3 or PXM-UI-S3/B back card.

Caution Anyone with physical access to the switch CP can reset the password, deny access to other users, and reconfigure the switch. To prevent unauthorized switch access and configuration, the switch should be installed in a secure area.

Step 2 When the login prompt appears, press **ESC, CTRL-Y** to reset the password.

Step 3 Log in using username *cisco* and password *cisco*.

Step 4 To maintain switch security after resetting the cisco user password, change the password using the **cnfpasswd** command.

Enabling and Disabling the User cisco Password Reset

If the switch you are managing is in an insecure area, you might want to disable the user cisco password reset feature. Otherwise, anyone with physical access to the switch CP can reset the password, deny access to other users, and reconfigure the switch. This feature can be enabled again at a later date if you know the user name and password for a user at the SERVICE_GP privilege level or higher.

To enable or disable the password reset feature, use the following procedure.

Step 1 Establish a configuration session using a user name with SERVICE_GP privileges or higher.

Step 2 To disable password reset, enter the **cnfpswdreset off** command.

Step 3 To enable password reset, enter the **cnfpswdreset on** command.

Step 4 To view the status of this feature, enter the **dsppswdreset** command.

Setting and Viewing the Node Name

The switch name identifies the switch you are working on, which is important when you are managing multiple switches. The current switch name appears in the CLI prompt when you are managing PXM cards and service modules. To change the switch name, use the following procedure.

Step 1 Establish a configuration session using a user name with SUPER_GP privileges or higher.

Step 2 Enter the following command after the switch prompt:

```
unknown.7.PXM.a > cnfname <node name>
```

Enter up to 32 characters for the new node name, and since the node name is case-sensitive, be sure to use the correct case. For example:

```
unknown.7.PXM.a > cnfname mgx8850a
This node name will be changed to mgx8850a. Please Confirm
cnfname: Do you want to proceed (Yes/No)? y
cnfname: Configured this node name to mgx8850a Successfully.

mgx8850a.7.PXM.a>
```

Note The node name cannot contain any spaces or special characters.

The new name appears immediately in the next CLI prompt.

Viewing and Setting the Switch Date and Time

The switch date and time is appended to event messages and logs. To assure that events are properly time stamped, use the following procedure to view and change the date and time.

Note The procedure that follows propagates the switch date and time to all cards on the switch except for the RPM cards. Use the CLI to manually configure the switch date and time on each RPM card in your switch, or use SNTP to enable each RPM card to retrieve the date and time from a network server.

Step 1 Establish a configuration session using a user name with SUPER_GP privileges or higher.

Step 2 To view the current switch date and time, enter the following command after the switch prompt:

```
mgx8850a.7.PXM.a> dspdate
```

Step 3 To change the switch date, enter the following command:

```
mgx8850a.7.PXM.a> cnfdate <mm/dd/yyyy>
```

Step 4 To change the time zone, enter the following command:

```
mgx8850a.7.PXM.a> cnftmzn <timezone>
```

Replace *timezone* with one of the parameter values listed in Table 2-4. If your switch is located outside the Western Hemisphere, select **GMT** (see Table 2-4) and use the next step to specify an offset from GMT. If your switch is located in the Western Hemisphere choose the appropriate option from Table 2-4. *Daylight* times are adjusted by one hour in the Fall and Spring for daylight savings. *Standard* times are not adjusted.

Table 2-4 Time Zones for cnftmzn Command

Parameter Value	Time Zone
CDT	Central Daylight Time
CST	Central Standard Time
EDT	Eastern Daylight Time
EST	Eastern Standard Time
GMT	Greenwich Mean Time
MDT	Mountain Daylight Time
MST	Mountain Standard Time
PDT	Pacific Daylight Time
PST	Pacific Standard Time

Step 5 To configure an offset from GMT, enter the following command:

```
mgx8850a.7.PXM.a> cnftmzngmt <timeoffsetGMT>
```

Replace <*timeoffsetGMT*> with the offset in hours from GMT. Enter a number from -12 to +12.

Step 6 To change the switch time, enter the following command:

```
mgx8850a.7.PXM.a> cnftime <hh:mm:ss>
```

Replace <*hh*> with the hour of the day (0 to 23), *mm* with the minute of the hour (0 to 59), and *ss* with the number of seconds in the minute (0 to 59).

Step 7 To verify the new date and time settings, enter the **dspdate** command.

Configuring PNNI Node Parameters

The MGX switches support many PNNI configuration commands. This section describes how to configure the basic PNNI configuration parameters for the switch. Chapter 8, "Managing PNNI Nodes and PNNI Routing," describes how to manage PNNI after you have brought up the PNNI node.

Caution It is important to configure the PNNI node parameters before you start creating SPVCs as described in Chapter 3, "Provisioning PXM1E Communication Links." If you create SPVCs using the default PNNI node parameters and later change those parameters, the node will advertise the old ATM address

information for the older SPVCs as well as the new ATM address information. To keep PNNI running at maximum efficiency, set the PNNI node parameters to the proper values before creating SPVCs, or delete and recreate old SPVCs after making PNNI node parameter updates.

Adding the PNNI Controller

The PNNI controller simplifies switch configuration by using PNNI protocol to discover call routes in an ATM network. Without the PNNI controller, each route through the network would have to be defined manually. Chapter 8, "Managing PNNI Nodes and PNNI Routing," provides more information on PNNI. This section describes how to enable and configure the PNNI controller for the switch.

Note Before entering the following command, you must log in as a user with SUPER_GP privileges or higher.

To enable and configure the PNNI controller, enter the following command:

```
mgx8850a.7.PXM.a> addcontroller <cntrlrId> i <cntrlrType> <slot> [cntrlrName]
```

Table 2-5 describes the parameters for the **addcontroller** command.

Tip Remember to include the **i** option, which identifies the controller as an internal controller.

Table 2-5 Parameter Descriptions for the addcontroller Command

Parameter	Values	Descriptions
cntrlrId	2	Controller ID. Enter **2** to specify a PNNI controller or **3** to specify an MPLS controller. **Note** Option **3** (the MPLS controller) is not supported for PXM1E cards.
—	i	Enter the value **i**. This parameter will support additional values in future releases.
cntrlrType	2	Controller type. Enter **2** to specify a PNNI controller.
slot	1, 2, 7, 8	Slot number for PXM cards. Enter **1** or **2** to specify the PXM1E as the PNNI controller host on a Cisco MGX 8830 switch. Enter **7** or **8** to specify the PXM as the PNNI controller host on a Cisco MGX 8850 or Cisco MGX 8950 switch, or on a Cisco MGX 8880 Media Gateway.
cntrlrName	text	Controller name. This parameter is optional. You can enter a text name to identify the PNNI or MPLS controller. If the name you want to use includes one or more space characters, enclose the entire name with quotation marks. **Note** The MPLS label switch controller (LSC) function is not supported on PXM1E cards.

To display the PNNI controller configuration, enter the **dspcontrollers** command:

```
mgx8850a.7.PXM.a> dspcontrollers
pxm1e                          System Rev: 03.00   May. 07, 2002 16:42:18 GMT
MGX8850                                            Node Alarm: MAJOR
Number of Controllers:        1
Controller Name:
Controller Id:                2
Controller Location:          Internal
Controller Type:              PNNI
Controller Logical Slot:      7
Controller Bay Number:        0
Controller Line Number:       0
Controller VPI:               0
Controller VCI:               0
Controller In Alarm:          NO
Controller Error:
```

Setting the PNNI Level and Peer Group ID

The *Cisco PNNI Network Planning Guide for MGX and SES Products* provides guidelines for selecting a PNNI level and peer group ID. To set these parameters in the switch, use the following procedure.

Step 1 Establish a configuration session using a user name with SUPER_GP privileges or higher.

Step 2 Disable PNNI node operation by entering the following command:

```
mgx8850a.7.PXM.a> cnfpnni-node <node-index> -enable false
```

The *node-index* uniquely defines a logical PNNI node within the switch. Initially, there is just one logical PNNI node at the lowest PNNI level, and its index number is 1. If you add a higher level logical node to the physical node, the first higher level will be numbered two, and the next higher level will be number three. Additional levels receive sequentially higher node index numbers.

During this general node configuration, you are setting the PNNI level and peer group ID for the lowest PNNI level, so replace *node-index* with 1.

Note For instructions on creating logical nodes above the lowest PNNI level, see Chapter 8, "Managing PNNI Nodes and PNNI Routing."

Step 3 Change the PNNI level and peer group ID with the **cnfpnni-node** command as follows:

```
mgx8850a.7.PXM.a> cnfpnni-node <node-index> [-pgId level:peerGroupID]
```

To configure the lowest PNNI level, replace <*node-index*> with 1. Replace *level* with the PNNI level you want to use, and replace *peerGroupID* with the 13-byte peer group ID you want to use. For example:

```
mgx8850a.7.PXM.a> cnfpnni-node 1 -pgId 56:47.00.9181.0000.0100.0000.0000.00
```

Step 4 Enable PNNI node operation by entering the following command:

```
mgx8850a.7.PXM.a> cnfpnni-node <node-index> -enable true
```

Replace *node-index* with the value you used when disabling and reconfiguring the PNNI node.

Step 5 To display the PNNI node configuration, enter the following command:

```
mgx8850a.7.PXM.a> dsppnni-node
```

The switch displays a report similar to the following example:

```
mgx8850a.7.PXM.a> dsppnni-node

node index: 1                      node name: mgx8850a
   Level...............        56     Lowest..............      true
   Restricted transit..       off     Complex node........       off
   Branching restricted        on
   Admin status........        up     Operational status..        up
   Non-transit for PGL election..       off
   Node id...............56:160:47.00918100000000001a531c2a.00001a531c2a.01
   ATM address...........47.00918100000000001a531c2a.00001a531c2a.01
   Peer group id.........56:47.00.9181.0000.0100.0000.0000.00
```

Setting the PNNI Node Address

The *Cisco PNNI Network Planning Guide for MGX and SES Products* provides guidelines for setting the PNNI node address, which is identical to the switch ATM address. To set the PNNI node address, use the following procedure.

Caution When installing new switches, you can assume that each default node address will be unique. When PXM cards are repaired or moved between switches, however, it is possible that two switches will start using the same node address. To prevent duplicate node addresses, use your own address plan, and check the node address whenever a PXM card is replaced or moved from one switch to another.

Step 1 Establish a configuration session using a user name with SUPER_GP privileges or higher.

Step 2 Disable PNNI node operation by entering the following command:

```
mgx8850a.7.PXM.a> cnfpnni-node <node-index> -enable false
```

The *node-index* uniquely defines a logical PNNI node within the switch. Initially, there is just one logical PNNI node at the lowest PNNI level, and its index number is 1. If you add a higher level logical node to the physical node, the first higher level will be numbered two, and the next higher level will be number three. The node index is a reference to particular logical PNNI process in the node.

The PNNI address is configured at the lowest PNNI level, so replace <*node-index*> with 1.

Note The PNNI address you enter at the lowest level is used for all levels. PNNI increments the selector byte (which is the last byte) of the ATM address to represent logical nodes at higher PNNI levels.

Step 3 Change the PNNI address with the **cnfpnni-node** command as follows:

```
mgx8850a.7.PXM.a> cnfpnni-node <node-index> [-atmAddr atm-address]
```

To modify the PNNI address at the lowest level, replace <*node-index*> with 1, and replace *atm-address* with the 20-byte ATM address you want to use. For example:

```
mgx8850a.7.PXM.a> cnfpnni-node 1 -atmAddr 47.00918100000100001a531c2a.00001a531c2a.01
```

Note The ATM address in the example above shares the same seven most-significant bytes (level 56 peer groups use the first 7 bytes) as the peer group ID example in the previous section, so PNNI can advertise only the peer group ID outside of the peer group. If the ATM address and peer group ID used different prefixes, PNNI would have to advertise the node ATM address and the peer group ID. The ATM address should conform to your ATM address plan. For more information, refer to the *Cisco PNNI Network Planning Guide for MGX and SES Products*.

Tip Use the Copy and Paste functions of terminal session software to copy an existing ATM address into the command line. Then you can use your editing keys to make changes to the address before pressing **Enter** to execute the command.

Step 4 Enable PNNI node operation by entering the following command:

```
mgx8850a.7.PXM.a> cnfpnni-node <node-index> -enable true
```

Replace <*node-index*> with the value you used when disabling and reconfiguring the PNNI node.

Step 5 To display the PNNI node configuration, enter the command:

```
mgx8850a.7.PXM.a> dsppnni-node
```

The switch displays a report similar to the following example:

```
mgx8850a.7.PXM.a> dsppnni-node

node index: 1                     node name: 8850_LA
   Level...............        56     Lowest..............      true
   Restricted transit..       off     Complex node........       off
   Branching restricted        on
   Admin status........        up     Operational status..        up
   Non-transit for PGL election..       off
   Node id...............56:160:47.00918100000000001a531c2a.00001a531c2a.01
   ATM address...........47.00918100000100001a531c2a.00001a531c2a.01
   Peer group id.........56:47.00.9181.0000.0100.0000.0000.00
```

Setting the PNNI Node ID

The PNNI node ID appears in many CLI displays, including the **dsppnni-node** command display. The default node ID is *PNNIlevel*:160:*defaultATMaddress*. If you change the PNNI level or the node ATM address, you should also change the node ID so that the node ID represents the correct PNNI level and ATM address. This will make it easier to identify the node when using CLI commands because most CLI commands reference the node ID, not the node ATM address. For example:

```
mgx8850a.7.PXM.a> dsppnni-link

node index   : 1
Local port id:   16848897          Remote port id:   16848897
Local Phy Port Id: 1:2.1:1
   Type. lowestLevelHorizontalLink     Hello state....... twoWayInside
   Derive agg...........         0     Intf index...........  16848897
   SVC RCC index........         0     Hello pkt RX.........     22366
                                       Hello pkt TX.........     22178
   Remote node name.......8850_SF
   Remote node id.........56:160:47.00918100000100036b5e31b3.00036b5e31b3.01
   Upnode id..............0:0:00.000000000000000000000000.000000000000.00
   Upnode ATM addr........00.000000000000000000000000.000000000000.00
   Common peer group id...00:00.00.0000.0000.0000.0000.0000.00
```

In the example above, there is no reference to the ATM address for the remote switch named 8850_SF. However, if the node ID is set to match the ATM address, it will be easy to determine the ATM address of a remote switch.

To set the PNNI node ID, use the following procedure.

Step 1 Establish a configuration session using a user name with SUPER_GP privileges or higher.

Step 2 Disable PNNI node operation by entering the following command:

```
mgx8850a.7.PXM.a> cnfpnni-node <node-index> -enable false
```

The *node-index* uniquely defines a logical PNNI node within the switch. Initially, there is just one logical PNNI node at the lowest PNNI level, and its index number is 1. If you add a higher level logical node to the physical node, the first higher level will be numbered two, and the next higher level will be number three. The node index is a reference to particular logical PNNI process in the node.

The PNNI node ID is configured at the lowest PNNI level, so replace <*node-index*> with 1.

Note The node ID you enter at the lowest level is used for all levels. PNNI uses a modified version of the lowest level node ID for upper level nodes.

Step 3 Change the PNNI node ID with the **cnfpnni-node** command as follows:

```
mgx8850a.7.PXM.a> cnfpnni-node <node-index> [-nodeId PNNIlevel:160:atm-address]
```

To configure the lowest PNNI level, replace <*node-index*> with 1. Replace *PNNIlevel* with the lowest PNNI level, and replace *atm-address* with the 20-byte ATM address you want to use. For example:

```
mgx8850a.7.PXM.a> cnfpnni-node 1 -nodeId
56:160:47.00918100000100001a531c2a.00001a531c2a.01
```

Step 4 Enable PNNI node operation by entering the following command:

```
mgx8850a.7.PXM.a> cnfpnni-node <node-index> -enable true
```

Replace <*node-index*> with the value you used when disabling and reconfiguring the PNNI node.

Step 5 To display the PNNI node configuration, enter the command:

```
mgx8850a.7.PXM.a> dsppnni-node
```

The switch displays a report similar to the following example:

```
mgx8850a.7.PXM.a> dsppnni-node

node index: 1                      node name: 8850_LA
   Level...............        56     Lowest.............      true
   Restricted transit..       off     Complex node........      off
   Branching restricted        on
   Admin status........        up     Operational status..       up
   Non-transit for PGL election..       off
   Node id..............56:160:47.00918100000100001a531c2a.00001a531c2a.01
   ATM address...........47.00918100000100001a531c2a.00001a531c2a.01
   Peer group id.........56:47.00.9181.0000.0100.0000.0000.00
```

Setting and Viewing the SPVC Prefix

The *Cisco PNNI Network Planning Guide for MGX and SES Products* provides guidelines for selecting the SPVC prefix. The SPVC prefix is the ATM prefix that PNNI advertises for all SPVCs and Soft Permanent Virtual Paths (SPVP) on this node. The ATM address for each SPVC and SPVP is the combination of the SPVC prefix and a port identification number.

You can configure one SPVC node prefix per node. To set the SPVC prefix, use the following procedure.

Note Although the SPVC prefix is set to match the first 13 bytes of the PNNI node address by default, changing either the PNNI node address or the SPVC prefix has no effect on the other setting. If the PNNI node ATM address and the SPVC prefix do not match, the switch advertises both prefixes instead of just one, and this advertising takes additional bandwidth.

Note You can change the SPVC prefix only when no SPVCs or SPVPs have been defined. Once an SPVC has been defined, you must delete all SPVCs before you can change the SPVC prefix. For information on deleting SPVCs that terminate on PXM1E cards, see the "Deleting Connections" section in Chapter 3, "Provisioning PXM1E Communication Links." For information on deleting SPVCs that terminate on service modules, refer to the service module documentation listed in Table 1-1.

Step 1 Establish a configuration session using a user name with SUPER_GP privileges or higher.

Step 2 Use the following command to display the current SPVC prefix:

```
mgx8850a.7.PXM.a> dspspvcprfx
```

The switch response is similar to the following example:

```
mgx8850a.7.PXM.a> dspspvcprfx
SPVC Node Prefix: 47.00918100000000001a531c2a
```

Tip If the SPVC prefix begins with 47.009181000000, the SPVC prefix is probably set to the default value. To display the current PNNI node address, enter the **dsppnni-node** command.

Step 3 To change the SPVC prefix, enter the following command:

```
mgx8850a.7.PXM.a> cnfspvcprfx -prfx <prefix>
```

Replace *prefix* with the 13-byte prefix you want to use. For example:

```
mgx8850a.7.PXM.a> cnfspvcprfx -prfx 47.00918100000100001a531c2a
```

Note The SPVC prefix in the example above matches the first 13 bytes of the node PNNI address example presented in the previous section, so PNNI can advertise one prefix to support both SVC connections through the node and SPVCs. If the SPVC prefix does not match the corresponding bytes in the ATM address, PNNI advertises two prefixes instead of one. The SPVC prefix should conform to your ATM address plan. For more information, refer to the *Cisco PNNI Network Planning Guide for MGX and SES Products*.

Note The SPVC node prefix for each node must be unique within the network.

Step 4 Verify the correct entry of the prefix by entering the **dspspvcprfx** command.

Displaying PNNI Summary Addresses

After you configure the PNNI level, peer group ID, ATM address, and SPVC prefix, review the summary addresses the node will advertise. If all PNNI parameters are properly coordinated, the node should display a single summary address that represents all PNNI destinations in that node. To display the summary addresses, enter the **dsppnni-summary-addr** command as shown in the following example:

```
mgx8850a.7.PXM.a> dsppnni-summary-addr

node index: 1
   Type.............    internal     Suppress.............   false
   State............. advertising
   Summary address........47.0091.8100.0001.0000.1a53.1c2a/104
```

The example above is coordinated with the examples in the previous sections, so just one PNNI summary address is broadcast to the peer group. The following example demonstrates what happens when the node ATM address and the SPVC prefix are not coordinated:

```
mgx8850a.7.PXM.a> dsppnni-summary-addr

node index: 1
   Type.............    internal     Suppress.............   false
   State............. advertising
   Summary address........47.0091.8100.0000.0000.1a53.1c2a/104
```

```
mgx8850a.7.PXM.a> dsppnni-node

node index: 1                      node name: 8850_LA
   Level..............        56     Lowest.............      true
   Restricted transit..      off     Complex node........      off
   Branching restricted       on
   Admin status........       up     Operational status..        up
   Non-transit for PGL election..       off
   Node id..............56:160:47.00918100000000001a531c2a.00001a531c2a.01
   ATM address..........47.00918100000000001a531c2a.00001a531c2a.01
   Peer group id.........56:47.00.9181.0000.0100.0000.0000.00


mgx8850a.7.PXM.a> dspspvcprfx
SPVC Node Prefix: 47.00918100000100001a531c2a
```

In the example above, the node ATM address does not conform to the peer group ID or the SPVC prefix, so it must be advertised in addition to the SPVC prefix.

Configuring the MPLS Controller

The MPLS controller manages MPLS communications through the switch. Typically, the MPLS controller is used with a PNNI controller. Both MPLS and PNNI controllers can be used on the same line.

Note The MPLS label switch controller (LSC) function is not supported on Cisco MGX 8830 and Cisco MGX 8850 (PXM1E) switches.

Note Before entering the following command, you must log in as a user with SUPER_GP privileges or higher.

To enable and configure the MPLS controller, enter the following command:

```
mgx8850a.7.PXM.a > addcontroller <cntrlrId> i <cntrlrType> <lslot> [cntrlrName]
```

Table 2-5 describes the parameters for the **addcontroller** command.

Tip Remember to include the **i** option, which identifies the controller as an internal controller.

To display the MPLS controller configuration, enter the **dspcontrollers** command:

```
mgx8850a.7.PXM.a > dspcontrollers
```

Configuring Clock Sources

The "Guidelines for Creating a Network Clock Source Plan" section in Chapter 1, "Preparing for Configuration," introduces two clock source configuration options:

- manual
- Network Clock Distribution Protocol (NCDP)

Note When NCDP is enabled, your manual configuration is disabled, and vice versa. When you disable NCDP, your node reverts back to any manual clock configuration that was previously done on the node. If you re-enable NCDP after disabling it, your switch will remember your last NCDP configuration and use that unless you change it.

Both clock source options can use built-in hardware ports designed for Building Integrated Timing System (BITS) clock sources. Figure 2-3 shows how BITS clock sources connect to the PXM45 UI-S3 back card. Figure 2-4 shows how BITS clock sources connect to the PXM1E UI-S3/B back card.

The clock source ports on the PXM-UI-S3 and PXM-UI-S3/B cards can be used to receive clock signals from either T1 or E1 lines; the card does not support both line types simultaneously. These clock ports support stratum levels 1 to 3.

Note The PXM45 and PXM1E cards support T1 data (1.544Mbps) and E1 data (2.048Mbps) clock sources, and the PXM1/B supports both T1 and E1 data types and an E1 sync (2.048MHz) line as a clock input. The E1 sync line is not supported on switches with PXM45 and PXM1E cards.

Figure 2-3 BITS Clock Source Ports on PXM45 UI-S3 Back Card

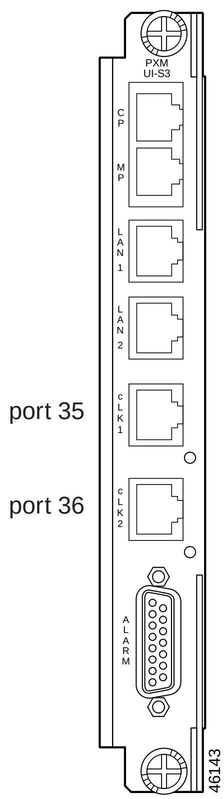
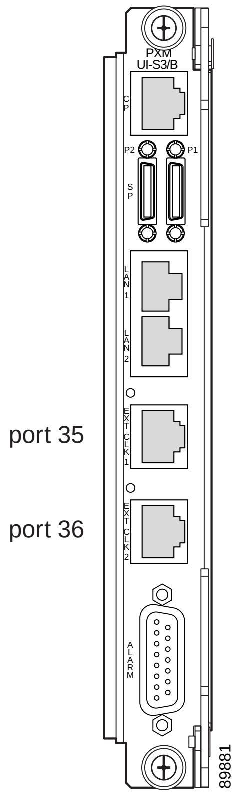


Figure 2-4 BITS Clock Source Ports on PXM1E UI-S3/B Back Card



Note When using an external clock source and redundant PXM cards, use a Y-cable to connect that clock source to the same clock port on both PXM cards. Otherwise, the clock source is available to only one of the PXM cards.

Manually Configuring BITS Clock Sources

The following procedure describes how to configure the switch to use clock sources on the BITS ports.

Note For instructions on configuring the switch to use a clock source on a PXM1E line, refer to the "Configuring PXM1E Line Clock Sources" section in Chapter 3, "Provisioning PXM1E Communication Links." For instructions on configuring the switch to use a clock source on an AXSM line, refer to the *Cisco ATM Services (AXSM) Configuration Guide and Command Reference for MGX Switches, Release 5*.

Step 1 Establish a configuration session using a user name with GROUP1 privileges or higher.

Step 2 To configure a primary or secondary BITS clock source, enter the **cnfclksrc** command:

```
mgx8850a.7.PXM.a > cnfclksrc <priority> [shelf.]slot.port -bits {e1|t1} [-revertive
{enable|disable}]
```

Table 2-6 describes the parameters for this command.

Table 2-6 Parameter Descriptions for cnfclksrc Command on the PXM

Parameter	Values	Descriptions
priority	primary or secondary	Replace <*priority*> with the type of clock source that is either primary or secondary. The default is primary.
shelf	1	The <*shelf*> value is always 1 and is optional.
slot	7	For the BITS clock, the <*slot*> number is 7 for a Cisco MGX 8850 (PXM1E/PXM45) or Cisco MGX 8950 switch, or slot 1 for a Cisco MGX 8830 switch.
port	35 to 36	The <*port*> number identifies the line on the PXM1E-UI-S3 or PXM1E-UI-S3/B back card to which the BITS clock is connected, and the type of line connected. Select the appropriate port number from the following: • Port 35 = upper line • Port 36 = lower line
-bits	e1 or t1	The **-bits** option specifies whether the clock source line is an E1 or T1.
-revertive	enable or disable	The **-revertive** option enables or disables the revertive feature for all clock sources. **Note** In releases prior to Release 5, this option applied only to BITS clock sources.

Step 3 To display the parameter configuration of the BITS clock sources, enter the **dspclkparms** command as shown in the following example:

```
M8850_LA.8.PXM.a > dspclkparms
BITS Cable  Type :     Twisted Pair
BITS Signal Type :     Data Mode
```

The above example shows the default BITS clock configuration parameters. The cable type can be either twisted pair or coax. The signal type can be either data mode or sync mode.

Step 4 If you need to change the BITS clock configuration parameters, enter the **cnfclkparms** command as follows:

```
M8850_LA.8.PXM.a > cnfclkparms <signal type> <cable type>
```

Replace the *signal type* variable with **1** to select data or with **2** to select sync. Replace the *cable type* variable with **1** to select twisted pair cabling or with **2** to select coaxial cabling.

Step 5 To configure an additional BITS clock source, repeat Step 2 using the correct parameters for the additional source. The clock parameters configured in Steps 3 and 4 apply to both BITS clock inputs.

Step 6 To display the clock source configuration, enter the **dspclksrcs** command.

The **dspclksrcs** command is described in the “Managing Manually Configured Clocks Sources,” in Chapter 9, “Switch Operating Procedures.”.

Note Manual clock distribution provides a revertive function that can apply when the primary clock source fails and is subsequently restored. A failure is a loss of the primary clock source after the switch has locked on to that clock source. If the primary clock source recovers and revertive mode is enabled, the switch automatically reverts to the primary source

The following command example shows how to configure a primary E1 external clock source at the upper connector of the PXM1E-UI-S3. Note the command punctuation.

```
mgx8850a.7.PXM.a > cnfclksrc primary 7.35 -bits e1
```

The next example configures a primary network clock source and enables the revertive option.

```
mgx8850a.7.PXM.a > cnfclksrc primary 7.36 -bits e1 -revertive enable
```

The last example disables the revertive function for an E1 BITS clock.

```
mgx8850a.7.PXM.a > cnfclksrc primary 7.36 -bits e1 -revertive disable
```

Enabling NCDP on a Node

Use the following procedure to enable NCDP on each node in your network.

Step 1 Enter the **cnfncdp** [*options*] command to enable NCDP on the node, set timer values, and specify the number of nodes in the clocking domain.

```
M8850_LA.8.PXM.a > cnfncdp -distributionMode 1 -maxNetworkDiameter 30 -hello 300 -holdtime
300 -topoChangeTimer 300
```

Table 2-7 describes the options available for the **cnfncdp** command.

Table 2-7 cnfncdp Command Parameters

Parameter	Description
-distributionMode	The clock distribution mode is either NCDP or manual. If manual, enter the **cnfclksrc** and its related commands for synchronization. Possible entries: 1 for NCDP or 2 for manual clocking Default = manual (2)
-maxNetworkDiameter	Maximum network diameter measured in hops. This is the maximum length of the spanning tree, in the range 3 through 200. Default = 20
-hello	Hello time Interval, in milliseconds, between PDUs. The range is 47 through 60000 milliseconds. Default = 500 milliseconds

Table 2-7 cnfncdp Command Parameters (continued)

Parameter	Description
-holdtime	Specifies the time interval, in milliseconds, between each PDU configuration. The range is 47 through 60000 milliseconds. Default = 500 milliseconds
-topoChangeTimer	Time interval, in milliseconds, for which the topology change notification bit will be sent in the the configuration PDUs. The range is from 47 through 60000 milliseconds. Default = 500 milliseconds

Step 2 Enter the **dspncdp** command to verify that the NCDP parameters were set properly.

```
M8850_LA.8.PXM.a > dspncdp
Distribution Mode                : ncdp
Node stratum level               : 3
Max network diameter             : 20
Hello time interval              : 500 ms
Hold Down time interval          : 500 ms
Topology change time interval    : 500 ms
Root Clock Source                : internal clock
Root Clock Source Reason         : Free Run
Root Clock Source Status         : ok
Root Stratum Level               : unknown
Root Priority                    : 0
Secondary Clock Source           : 0.0
Secondary Clock Source Reason    : unknown
Secondary Clock Source Status    : unknown
Last Clock Source change time    : N/A
Last Clock Source change reason : None
```

Once NCDP is enabled on your node, the best clock source and second best clock source are automatically selected and distributed to all nodes in the network that have NCDP enabled. If no previous NCDP clock configuration has been done, NCDP selects a root clock source that comes from an internal oscillator. If you want the root clock source to come from an external source, use the **cnfncdpclksrc** command as described in the "Configuring an NCDP Clock Source" section in Chapter 9, "Switch Operating Procedures."

Note Cisco recommends using an external clock source instead of the internal oscillator.

Caution If you want to specify the root clock source to come from an external source before you enable NCDP, use the **cnfncdpclksrc** <*portid*> **0** command as described in the "Configuring an NCDP Clock Source" section in Chapter 9, "Switch Operating Procedures." If you run **cnfncdpclksrc** <*portid*> **0** before you enable NCDP with the cnfncdp command, the root clock source will be the external clock you configured, instead of the internal oscillator.

If you wish to change the BITS clock selected by NCDP, enter the **cnfncdpclksrc** command, as described in the "Configuring an NCDP Clock Source" section in Chapter 9, "Switch Operating Procedures."

Setting the LAN IP Addresses

The switch uses two types of IP addresses for Ethernet LAN access:

- Boot IP addresses
- Disk IP addresses

The following sections describe how to set these addresses. For information on how the switch uses these addresses and how to choose the addresses, see the "Guidelines for Creating an IP Address Plan" section in Chapter 1, "Preparing for Configuration."

Note The switch also supports IP addresses for dial-in and ATM inband access. For more information on these access options, see Appendix C, "Supporting and Using Additional CLI Access Options."

Setting the Boot IP Address

The boot IP address is the LAN port IP address that a PXM card uses when it first starts up. If the switch cannot fully start, this IP address can be used to access the switch in boot mode. When the switch is properly configured (with different addresses set for the boot IP and disk IP addresses), the boot IP address can also be used to access the standby PXM card directly, while the disk IP address can be used to access the active PXM.

Note Because the disk IP address is stored on the PXM hard disk and is not used until after the runtime software loads, Cisco recommends that the boot IP address be set in every switch. This enables switch management over Ethernet when the boot software has loaded.

To set the boot IP address, use the **bootChange** command, which also allows you to define a remote boot location, a default gateway IP address, and a username and password for the remote boot location.

Step 1 Establish a configuration session using a user name with SUPER_GP privileges or higher.

Step 2 Enter the **bootChange** command as shown in the following example.

```
mgx8850a.1.PXM.a> bootChange

'.' = clear field;  '-' = go to previous field;  ^D = quit

boot device          : lnPci
```

Note Although the **bootChange** command display offers a "quit" option, this option does not work. To exit the **bootChange** command without making any changes, press return after each parameter appears. The **bootChange** display is complete when the switch prompt appears.

In this example, the switch is waiting for you to take action on the boot device option. Enter a period <**.**> to clear the current value (lnPci), enter minus <-> to go back to the previous field (although this is the first of 14 fields), or press **Return** to accept the current value and display the next option. The following example shows all options.

```
mgx8850a.7.PXM.a> bootChange

'.' = clear field;  '-' = go to previous field;  ^D = quit

boot device          : lnPci
processor number     : 0
host name            :
file name            :
inet on ethernet (e) : 172.29.52.6
inet on backplane (b):
host inet (h)        : 0.0.0.0
gateway inet (g)     : 172.29.52.1
user (u)             :
ftp password (pw) (blank = use rsh):
flags (f)            : 0x0
target name (tn)     : ??????????
startup script (s)   :
other (o)            :
```

Note The only two options that must be set to support the boot IP address are **inet on ethernet (e)** and **gateway inet**. The **bootChange** command operates only on the active card. If you are having trouble bringing up a standby card, you can set the boot IP address with the **sysChangeEnet** command as described in the "Troubleshooting Upgrade Problems" section in Appendix A, "Downloading and Installing Software Upgrades." If you set the boot IP address on the standby card with the **sysChangeEnet** command and it is different from the IP address set with the **bootChange** command on the active card, the standby card will start using the **bootChange** boot IP address when the card reaches standby mode.

Step 3 Accept, clear, or change option values as necessary until the **inet on ethernet** option appears. Table 2-8 defines the options that you can change.

Table 2-8 bootChange Command Option Descriptions

Option	Description
boot device	The lnPci value selects an external server as the boot source when the boot or runtime software is not found on the PXM hard disk.
processor number	Do not change this option.
host name	The host name identifies an external server that has switch boot and runtime software.
file name	This option defines the path and filename of the runtime software on a remote server.
inet on ethernet	This option selects the boot IP address and network mask for the PXM you are configuring. (This PXM is identified in the switch prompt.) Enter the address and mask in the format: a.b.c.d:ffffffff, where a.b.c.d is the IP address and fffffff is the network mask in hexadecimal format. **Note** The **bootChange** and **sysChangeEnet** commands are the only commands that can be used to set or change the network mask used for the boot IP address.
inet on backplane	Do not change this option.
host inet	The host inet option defines the IP address for the external server that has boot and runtime software for the switch.
gateway inet	The gateway inet option identifies the IP address for the default gateway on the subnet that hosts the switch.
user	This option defines a username that can be used for FTP access to the boot and runtime software files on a remote server.
ftp password	This option identifies a password that can be used for FTP access to the boot and runtime software files on a remote server.
flags	Do not change this option.
target name	Do not change this option.
startup script	Do not change this option.
other	Do not change this option.

Step 4 Set the **inet on ethernet (e)** option to the boot IP address value you want to use. The following example shows how the command appears when a new value has been entered:

```
inet on ethernet (e) : 172.29.52.88 172.29.52.8:ffffff00
```

The 172.29.52.88 address appeared as part of the prompt. If no address had been previously defined, no text would appear after the colon. In this example, 172.29.52.8 is the new boot IP address, and ffffff00 is the new network mask.

Step 5 Set the **gateway inet** option to the IP address for the default gateway on the subnet that hosts the switch.

Step 6 Accept, clear, or change values as necessary until the switch prompt reappears.

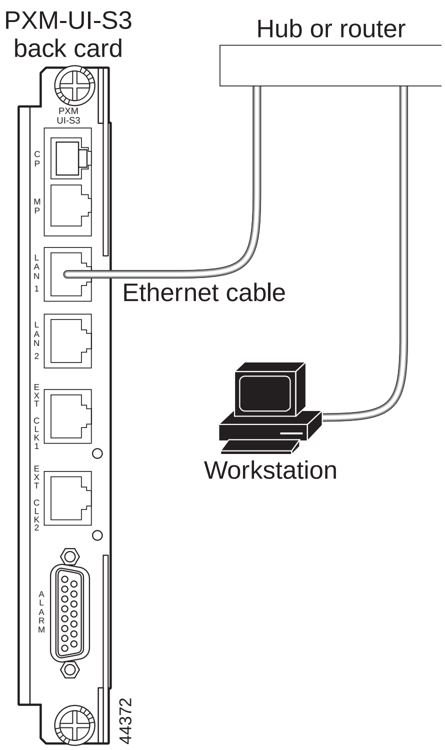
Step 7 To verify the new values you have set, enter the **bootChange** command and press **Return** for each of the 14 values.

Note If you used the **bootChange** command to enter a network mask for the first time, the new network mask should be operable and visible using the **dspipif** command. If you are changing the network mask, you must reset the active PXM to begin using the new network mask. For a redundant PXM configuration, use the **switchcc** command to switch control to the standby PXM and reset the formerly active card. For a standalone PXM configuration, use the **resetcd** command to reset the standalone PXM.

Setting the Disk IP Address

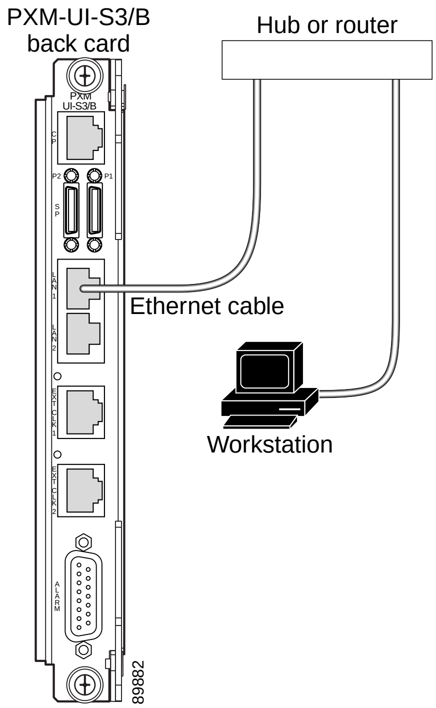
A local LAN connection extends switch management to all workstations that have connectivity to the LAN to which the switch is connected. Figure 2-5 shows the hardware required for a local LAN connection to a PXM45 UI-S3 card. Figure 2-6 shows the hardware required for a local LAN connection to a PXM1E UI-S3/B card.

Figure 2-5 Hardware Required for Local LAN Connections to PXM-UI-S3 Back Cards



Note The PXM-UI-S3 card shown in Figure 2-5 has two LAN ports. In the current release, only the LAN 1 connector is enabled for communications. Communication through the LAN 2 connector is disabled.

Figure 2-6 Hardware Required for Local LAN Connections to PXM-UI-S3/B Back Cards



Before you can manage the switch through the PXM LAN port, you must first assign an IP address to the LAN port. The disk IP address is the IP address that the active PXM uses when the runtime software is loaded.

Tip The significance of the disk IP address for the LAN Port is that it is stored on the hard disk and is not available until the runtime software is loaded on the PXM card and the card is active. To access the LAN port over Ethernet when a PXM is operating in boot or standby mode, you must use the Boot IP address.

The disk IP address can be set to match the boot IP address when only one IP address is available, or it can be set to a unique address to support access to the standby PXM during regular operation. For more information on how the boot and disk IP addresses are used, see Chapter 1, "Guidelines for Creating an IP Address Plan."

To set the disk IP address, enter the **ipifconfig** command as described in the following procedure.

Step 1 Establish a CLI management session using a username with SUPER_GP privileges. The default user name and password for this level are *superuser* and *superuser.*

Step 2 Verify that the disk IP address is not already configured by entering the **dspipif** command:

```
mgx8850a.7.PXM.a> dspipif lnPci0
```

Note If you omit the **lnPci0** option, the switch displays the configuration for all switch IP interfaces: the ATM interface (atm0), the PXM LAN port interface (lnPci0), and the PXM maintenance port interface (sl0). Note that the address for each interface must be unique.

In the IP Interface Configuration Table, look for an Internet address entry under the lnPci entry. If an IP address is configured, you can use that address and skip the rest of this procedure. However, if the address has not been entered or is incompatible with your network, you must configure a valid disk IP address as described in the next step.

Note If you are using CWM to manage your network, the IP address 10.0.XX cannot be used as the disk IP address for the switch.

Step 3 To set the disk IP address for the LAN port, enter the **ipifconfig** command using the following format:

```
mgx8850a.7.PXM.a> ipifconfig lnPci0 <IP_Addr> <netmask Mask>
```

Replace <*IP_Addr*> with the IP address you want this port to use, and replace <*Mask*> with the network mask used on this network.

Note There are other options for the **ipifconfig** command, and you can set one or more options simultaneously. Any options you do not define in a command remain unchanged. For more information on this command, refer to *Cisco MGX 8850 (PXM45/PXM1E), Cisco MGX 8950, Cisco MGX 8830, and Cisco MGX 8880 Command Reference, Release 5*.

Step 4 Verify that the disk IP address changes by entering the **dspipif** command. For example:

```
mgx8850a.7.PXM.a> dspipif lnPci0
mgx8850a                       System Rev: 02.01   Sep. 17, 2001 17:39:15 PST
MGX8850                                            Node Alarm: NONE
IP INTERFACE CONFIGURATION
--------------------------------------------------------------------
lnPci (unit number 0):
     Flags: (0x63) UP BROADCAST ARP RUNNING
     Internet address: 172.29.52.88
     Broadcast address: 172.29.255.255
     Netmask 0xffff0000 Subnetmask 0xffffff00
     Ethernet address is 00:00:1a:53:1c:2a
     Metric is 0
     Maximum Transfer Unit size is 1500
     1174481 packets received; 516574 packets sent
     502 input errors; 3 output errors
     3 collisions
     DISK IP address: 172.29.52.88
```

Starting a CLI Session Through the LAN Port

The switch includes a Telnet server process that you can use to connect to and manage the switch. Before you can establish a CLI Telnet session, you must set up the hardware for your access method and assign the appropriate boot and disk IP addresses.

After the disk IP interface has been configured and a physical path established to the Cisco MGX switch, you can start a CLI session using a workstation with a Telnet client program. To establish a CLI management session, use the following procedure.

Step 1 Start the Telnet client program on a LAN workstation with a command similar to the following:

```
C:>telnet ipaddress
```

Replace *ipaddress* with the appropriate disk IP address as follows:

- Active PXM card: enter the disk IP address.
- Standby PXM card: enter the Boot IP address (requires separate addresses for boot and disk IP addresses).
- PXM in backup boot mode: enter the Boot IP address.

Note The Telnet program on your workstation may require a different start up and connection procedure. For instructions on operating your Telnet program, refer to the documentation for that product.

Step 2 If the Login prompt does not appear, press **Enter**.

The Login prompt comes from the switch and indicates that the workstation has connected successfully to the switch.

Step 3 When the Login prompt appears, enter the user name provided with your switch and press **Enter**.

Step 4 When the password prompt appears, enter the password provided with your switch and press **Enter**.

After you successfully log in, a prompt appears that is similar to the following:

```
mgx8850a.7.PXM.a>
```

Configuring for Network Management

The Cisco MGX switches include a Simple Network Management Protocol (SNMP) agent that you can configure for communications with a network management station such as Cisco WAN Manager (CWM) or a third-party SNMP manager. When configured for SNMP management, the switch accepts configuration commands from management stations and sends status and error messages to the management station.

Typically, CWM operates on a workstation that is connected to an IP network. CWM uses IP over ATM connections to connect to Cisco MGX switches. For information on establishing this type of access, see the “Configuring the Switch” section in Appendix C, “Supporting and Using Additional CLI Access Options.”

To support the auto-discovery feature of CWM, ILMI should be brought up on all links between the CWM workstation and the switches it will manage. For information on bringing up ILMI on a PXM1E card, see the “Configuring ILMI on a Port” section in Chapter 3, “Provisioning PXM1E Communication Links.” For information on bringing up ILMI on an AXSM card, refer to the “Configuring ILMI on a Port” section in Chapter 2 of the *Cisco ATM Services (AXSM) Configuration Guide and Command Reference for MGX Switches, Release 5.*

The following tasks are described in this section:

- Configuring the SNMP Trap Source IP Address
- Configuring the SNMP Manager Destination IP Address
- Configuring the Community String and General Switch Information

Configuring the SNMP Trap Source IP Address

The SNMP trap source IP address is sent to SNMP managers, such as CWM, in the SNMP trap Packet Data Unit (PDU). This IP address identifies the source of the trap and can be used by the SNMP manager to access the remote SNMP agent. This address must be configured to enable communications with an SNMP manager.

Note If the trap manager IP address is not set, CWM will reject traps from the switch.

The switch can communicate with an SNMP manager over the disk or ATM IP interfaces. In some installations, the disk IP interface will be used for CLI management and the ATM IP interface will be used for SNMP management. When you select the SNMP trap manager IP address, you must select the correct interface address.

To define the SNMP trap manager IP address, enter the **cnftrapip** command as follows:

```
mgx8850a.7.PXM.a> cnftrapip <ipaddress>
```

The IP address should match the disk IP address or the ATM interface IP address. For information on setting and viewing the disk IP address, see the "Setting the LAN IP Addresses" section earlier in this chapter. For information on setting and viewing the ATM interface IP address, see the "Configuring the Switch" section in Appendix C, "Supporting and Using Additional CLI Access Options."

Configuring the SNMP Manager Destination IP Address

The SNMP Manager destination IP address identifies the IP address of an SNMP manager, such as CWM, to which the switch sends SNMP traps. If you are using CWM to manage the switch, CWM will automatically configure the destination IP address on the switch. If you are using another SNMP manager, you can configure the destination IP address with the **addtrapmgr** command as follows:

```
mgx8850a.7.PXM.a> addtrapmgr <ipaddress> <port>
```

Replace *ipaddress* with the IP address of the SNMP manager, and replace *port* with the UDP port number assigned to that manager. For more information on the SNMP manager IP address, refer to the SNMP manager documentation.

Configuring the Community String and General Switch Information

To configure information about a switch in the local SNMP agent, use the following procedure.

Step 1 Establish a configuration session using a user name with SUPER_GP privileges or higher.

Step 2 To define the SNMP passwords for network management, enter the following command:

```
mgx8850a.7.PXM.a> cnfsnmp community password ro|rw
```

The network management passwords are called community strings, and there is a read-only (ro) community string and a read-write (rw) community string. Network management programs that use the ro community string can read switch data (using SNMP GET or GET-NEXT requests), but they cannot change the switch configuration. Network management programs that use the rw community string can read switch data and change the switch configuration (using SNMP SET requests). The default ro community string is *public* and the default rw community string is *private*.

The following example shows how to change the ro community string:

```
mgx8850a.7.PXM.a> cnfsnmp community cisco ro
```

Step 3 To define a text string that identifies the location of the switch to the management station, enter the following command:

```
mgx8850a.7.PXM.a> cnfsnmp location [location]
```

Replace *location* with 0 to 255 characters of text. The text can include space characters. The location value is sent to SNMP managers when information is requested about the sysLocation MIB object.

The following example shows how to change the SNMP location string:

```
M8850_LA.8.PXM.a > cnfsnmp location Doc Lab
```

Step 4 To define a text string that identifies a person to contact regarding issues with this switch, enter the following command:

```
mgx8850a.7.PXM.a> cnfsnmp contact [contact]
```

Replace *contact* with 0 to 255 characters of text. The text can include space characters. The contact value is sent to SNMP managers when information is requested about the sysContact MIB object.

The following example shows how to change the SNMP contact string:

```
M8850_LA.8.PXM.a > cnfsnmp contact Lab Manager
```

Step 5 To display the SNMP agent configuration, enter the **dspsnmp** command. The command display appears similar to the following example:

```
M8850_LA.8.PXM.a > dspsnmp
M8850_LA                         System Rev: 05.00   Apr. 13, 2004 20:38:41 GMT
MGX8850                                              Node Alarm: MAJOR

Community (rw):          private
Community (ro):          cisco
System Location:         Doc Lab
System Contact:          Lab Manager
```

Verifying the Hardware Configuration

Before you can configure your switch, you need to collect information about the cards and software installed on the switch. The primary reason for collecting this information is to verify that the correct cards are installed in the correct slots, and that the back cards installed are indeed compatible with the front cards they serve. The "Hardware Survey Worksheets" section of Appendix E, "Hardware Survey and Software Configuration Worksheets," provides worksheets that you can use to record the hardware installation for the different Cisco MGX switches.

The following procedure describes how to display the information you need to complete the hardware survey worksheets. It also describes how to verify that the correct upper and lower back cards are installed for each front card.

Step 1 Establish a configuration session at any access level.

Step 2 To display a list of all the cards installed in the switch, enter the **dspcds** command after the switch prompt:

```
mgx8850a.7.PXM.a> dspcds
```

A Cisco MGX 8830 switch displays a report similar to the following example:

```
mgx8830b.1.PXM.a> dspcds
mgx8830b                         System Rev: 03.00   Apr. 25, 2002 23:20:16 GMT
Chassis Serial No:   SCA053000KM Chassis Rev: A0     GMT Offset: 0
                                                     Node Alarm: MAJOR
Card  Front/Back          Card           Alarm      Redundant   Redundancy
Slot  Card State          Type           Status     Slot        Type
---   ----------          --------       --------   -------     -----

01    Active/Active       PXM1E-4-155    MAJOR      02          PRIMARY SLOT
02    Standby/Active      PXM1E-4-155    NONE       01          SECONDARY SLOT
03    Active/Empty        RPM            NONE       NA          NO REDUNDANCY
04    Active/Active       FRSM_2CT3      MINOR      05          PRIMARY SLOT
05    Standby/Active      FRSM_2CT3      NONE       04          SECONDARY SLOT
06    Active/Active       CESM_8T1       NONE       NA          NO REDUNDANCY
07    Active/Active       SRM_3T3        NONE       14          PRIMARY SLOT
11    Active/Active       FRSM_8T1       NONE       NA          NO REDUNDANCY
12    Empty               ---            ---        ---         ---
13    Standby/Active      FRSM_8T1       NONE       NA          NO REDUNDANCY
14    Standby/Active      SRM_3T3        NONE       07          SECONDARY SLOT
```

A Cisco MGX 8850 switch displays a report similar to the following example:

```
M8850_LA.8.PXM.a > dspcds
M8850_LA                         System Rev: 04.00   May. 08, 2003 08:23:19 GMT
Chassis Serial No:   SAA03230375 Chassis Rev: B0     GMT Offset: 0
                                                     Node Alarm: CRITICAL
Card  Front/Back          Card           Alarm      Redundant   Redundancy
Slot  Card State          Type           Status     Slot        Type
---   ----------          --------       --------   -------     -----

01    Active/Active       AXSM_4OC12     NONE       NA          NO REDUNDANCY
02    Active/Active       AXSM_4OC12     NONE       NA          NO REDUNDANCY
03    Active/Active       AXSM_16T3E3    NONE       NA          NO REDUNDANCY
04    Active-F/Active     AXSME_16T3E3   MAJOR      NA          NO REDUNDANCY
05    Active-F/Active     AXSME_2OC12    MAJOR      NA          NO REDUNDANCY
06    Active/Active       AXSM_16OC3_B   MAJOR      NA          NO REDUNDANCY
07    Empty Resvd/Empty   ---            MAJOR      08          PRIMARY SLOT
08    Active/Active       PXM45B         NONE       07          SECONDARY SLOT
09    Active/Active       RPM_PR         NONE       NA          NO REDUNDANCY
10    Empty               ---            ---        ---         ---
11    Mismatch/Empty      UNKNOWN        NONE       NA          NO REDUNDANCY
12    Active/Active       AXSM-32-T1E1-E NONE       NA          NO REDUNDANCY
13    Active/Active       FRSM_2CT3      NONE       NA          NO REDUNDANCY
14    Active/Active       FRSM_8T1       NONE       NA          NO REDUNDANCY
15    Empty               ---            ---        ---         ---

Type <CR> to continue, Q<CR> to stop:
M8850_LA                         System Rev: 04.00   May. 08, 2003 08:23:19 GMT
Chassis Serial No:   SAA03230375 Chassis Rev: B0     GMT Offset: 0
                                                     Node Alarm: CRITICAL
Card  Front/Back          Card           Alarm      Redundant   Redundancy
Slot  Card State          Type           Status     Slot        Type
---   ----------          --------       --------   -------     -----

16    Active/Active       SRME_OC3       NONE       15          SECONDARY SLOT
29    Active/Active       CESM_8T1       NONE       NA          NO REDUNDANCY
30    Active/Active       FRSM_HS2/B     NONE       NA          NO REDUNDANCY
31    Empty               ---            ---        ---         ---
32    Empty               ---            ---        ---         ---
```

A Cisco MGX 8950 switch displays a report similar to the following example:

```
M8950_DC.8.PXM.a > dspcds
M8950_DC                         System Rev: 04.00   May. 08, 2003 09:10:06 GMT
Chassis Serial No:   SCA0504043H Chassis Rev: A0     GMT Offset: 0
                                                     Node Alarm: CRITICAL
Card  Front/Back          Card           Alarm      Redundant   Redundancy
Slot  Card State          Type           Status     Slot        Type
---   ----------          --------       --------   -------     -----

01    Active/Active       AXSM_4OC12     MINOR      NA          NO REDUNDANCY
02    Active/Active       AXSM_16OC3     NONE       NA          NO REDUNDANCY
03    Empty               ---            ---        ---         ---
04    Empty               ---            ---        ---         ---
05    Active/Active       AXSM_1OC48_B   NONE       NA          NO REDUNDANCY
06    Empty               ---            ---        ---         ---
07    Standby/Active      PXM45B         NONE       08          PRIMARY SLOT
08    Active/Active       PXM45C         NONE       07          SECONDARY SLOT
09    Active/Empty        XM_60          NONE       NA          NO REDUNDANCY
10    Active/Empty        XM_60          NONE       NA          NO REDUNDANCY
11    Empty               ---            ---        ---         ---
12    Active/Active       AXSM_16OC3     NONE       NA          NO REDUNDANCY
13    Empty               ---            ---        ---         ---
14    Active/Active       AXSM_4OC12     NONE       NA          NO REDUNDANCY
15    Active/Active       AXSM-1-9953-XG MINOR      NA          NO REDUNDANCY

Type <CR> to continue, Q<CR> to stop:
M8950_DC                         System Rev: 04.00   May. 08, 2003 09:10:06 GMT
Chassis Serial No:   SCA0504043H Chassis Rev: A0     GMT Offset: 0
                                                     Node Alarm: CRITICAL
Card  Front/Back          Card           Alarm      Redundant   Redundancy
Slot  Card State          Type           Status     Slot        Type
---   ----------          --------       --------   -------     -----

16    Active/Active       AXSM-4-2488-XG NONE       NA          NO REDUNDANCY
25    Active/Empty        XM_60          NONE       NA          NO REDUNDANCY
26    Active/Empty        XM_60          NONE       NA          NO REDUNDANCY

M8950_DC.8.PXM.a >
```

Step 3 In the appropriate worksheet in the “Hardware Survey Worksheets” section of Appendix E, “Hardware Survey and Software Configuration Worksheets,” write down the following information for each card:

- Front card type (from Card Type column)
- Redundant slot
- Redundancy type

Step 4 For each slot in which a card is installed, complete the following tasks:

a. Enter the **dspcd** command as follows:

```
mgx8830b.1.PXM.a> dspcd <slot>
```

The **dspcd** command displays information that is unique to a particular card. For PXM1E cards, the switch displays a report similar to the following example:

```
mgx8830b.1.PXM.a> dspcd 2
mgx8830b                         System Rev: 03.00   Apr. 25, 2002 22:51:15 GMT
MGX8830                                              Node Alarm: MAJOR
Slot Number    2    Redundant Slot:  1

                    Front Card          Upper Card          Lower Card
                    ----------          ----------          ----------

Inserted Card:      PXM1E-4-155         UI Stratum3         SMFIR_4_OC3
Reserved Card:      PXM1E-4-155         UI Stratum3         SMFIR_4_OC3
State:              Standby             Active              Active
Serial Number:      S1234567890         SAK0325008J         SAG05415SW9
Prim SW Rev:        3.0(0.39)A          ---                 ---
Sec SW Rev:         3.0(0.39)A          ---                 ---
Cur SW Rev:         3.0(0.39)A          ---                 ---
Boot FW Rev:        3.0(0.26)A          ---                 ---
800-level Rev:      E2                  03                  4P
800-level Part#:    800-12345-01        800-05787-01        800-18663-01
CLEI Code:                              /0               0
Reset Reason:       On Reset From Shell
Card Alarm:         NONE
Failed Reason:      None
Miscellaneous Information:

Type <CR> to continue, Q<CR> to stop:
mgx8830b                         System Rev: 03.00   Apr. 25, 2002 22:51:15 GMT
MGX8830                                              Node Alarm: MAJOR

Crossbar Slot Status:      EMPTY

Alarm Causes
------------
    NO ALARMS

mgx8850a.7.PXM.a>
```

Note The **dspcd** and **dspcds** commands are very similar, but they produce different reports. The **dspcd** command displays information about a specific card. The **dspcds** command displays summary information for all cards in the switch.

For service modules, the switch displays a report similar to the report displayed on the PXM cards. The following example shows the **dspcd** report for a CESM8T1 card:

```
mgx8830b.1.PXM.a> dspcd 6
mgx8830b                          System Rev: 03.00   Apr. 25, 2002 23:01:03 GMT
MGX8830                                                Node Alarm: MAJOR
Slot Number:   6    Redundant Slot: NONE

                   Front Card           Back Card
                   ----------           ---------
Inserted Card:      CESM_8T1            RJ48_8T1
Reserved Card:      UnReserved          UnReserved
State:              Active              Active
Serial Number:      A79907              A12475
Prim SW Rev:        20.0(0.106)D        ---
Sec SW Rev:         20.0(0.106)D        ---
Cur SW Rev:         20.0(0.106)D        ---
Boot FW Rev:        1.0(2.0)            ---
800-level Rev:
800-level Part#:    000-00000-00        000-00000-00
CLEI Code:
Reset Reason:       On Reset from PXM
Card Alarm:         NONE
Failed Reason:      None
Miscellaneous Information:


Type <CR> to continue, Q<CR> to stop:
mgx8830b                          System Rev: 03.00   Apr. 25, 2002 23:01:03 GMT
MGX8830                                                Node Alarm: MAJOR
Crossbar Slot Status:      No Crossbar

Alarm Causes
------------
    NO ALARMS
```

For SRM cards, the switch displays a report similar to the following example:

```
mgx8830b.1.PXM.a> dspcd 7
mgx8830a                          System Rev: 03.00   Apr. 25, 2002 23:10:08 GMT
MGX8830                                                Node Alarm: MAJOR
Slot Number    7    Redundant Slot:  14
                   Front Card           Back Card
                   ----------           ---------
Inserted Card:      SRM_3T3             BNC_3T3
Reserved Card:      UnReserved          UnReserved
State:              Active              Active
Serial Number:      955802              SBK043600TT
Prim SW Rev:        ---                 ---
Sec SW Rev:         ---                 ---
Cur SW Rev:         ---                 ---
Boot FW Rev:        ---                 ---
800-level Rev:      BB                  A0
800-level Part#:    000-00000-00        800-03148-02
CLEI Code:                              BAI9A6VAAA
Reset Reason:       On Power up
Card Alarm:         NONE
Failed Reason:      None
Miscellaneous Information:


Type <CR> to continue, Q<CR> to stop:
```

```
mgx8830                        System Rev: 03.00   Apr. 25, 2002 23:10:08 GMT
MGX8830                                             Node Alarm: MAJOR
Crossbar Slot Status:      No Crossbar

Alarm Causes
------------
    NO ALARMS
```

Note You can not run the **dspcd** command on the SRM itself, because all SRM card configuration is done from the PXM card. Enter **dspcd** <*SRM_slot_number*> at the PXM to display information about the SRM cards in your switch.

b. In the worksheet for your switch type, write down the following information for each card:

- Upper back card type that appears in the Upper Card column of the Inserted Card row.
- Lower back card type that appears in the Lower Card column of the Inserted Card row.

Tip Another way to display a detailed report on a card is to enter the **cc** command to select the card, then use the **dspcd** command without a slot number. However, the preferred method is to use the **dspcd** command with a slot number because this method can display information on a card when card errors prevent access through the **cc** command.

Step 5 After you enter the required information for all cards in hardware survey worksheet, use Table 2-9 to verify that each card is installed in a slot that supports that card type. You also need to verify that the correct back cards are installed for the corresponding front cards.

Note The locations where the upper and lower back cards are installed are also called bays. On a Cisco MGX 8850 (PXM1E/PXM45) or Cisco MGX 8950 switch, each slot has an upper and a lower bay for back cards.

If any of the cards are installed incorrectly, refer to the *Cisco MGX 8850 (PXM1E/PXM45), Cisco MGX 8950, Cisco MGX 8830, and Cisco MGX 8880 Hardware Installation Guide, Releases 2 Through 5* for instructions on installing the cards correctly.

Table 2-9 Valid Card Installation Options

Front Card Type	Description	Back Card Types	Valid Back Card Bay Locations	MGX 8830 Valid Slot Numbers	MGX 8850 Valid Slot Numbers	MGX 8880 Valid Slot Numbers	MGX 8950 Valid Slot Numbers
AUSM8E1/B	8 port ATM Universal Service Modules with E1 interfaces	RJ48-8E1 MGX-RJ48-8E1[1] R-RJ48-8E1 SMB-8E1 R-SMB-8E1	Upper and lower	3-6, 10-13	1-6, 9-14, 17-22, 25-30[2]	—	—
AUSM8T1/B	8 port ATM Universal Service Modules with T1 interfaces	RJ48-8T1 R-RJ48-8T1	Upper and lower	3-6, 10-13	1-6, 9-14, 17-22, 25-30[2, 3]	—	—

Table 2-9 Valid Card Installation Options (continued)

Front Card Type	Description	Back Card Types	Valid Back Card Bay Locations	MGX 8830 Valid Slot Numbers	MGX 8850 Valid Slot Numbers	MGX 8880 Valid Slot Numbers	MGX 8950 Valid Slot Numbers
AXSM-1-2488[4]	1 port OC-48/STM-64 **Note** No traffic shaping supported.	SMFSR-1-2488 SMFLR-1-2488 SMFXLR-1-2488	Upper	—	1–6, 9–14	—	—
AXSM-1-2488/B[4]	1 port OC-48/STM-16 **Note** No traffic shaping supported.	SMFSR-1-2488/B SMFLR-1-2488/B SMFXLR-1-2488/B	Upper	—	1–6, 9–14	1–6, 9–14	1-6, 11-16
AXSM-1-9953-XG[4]	1-port OC192/STM-64	SMFSR-1-9953 SMFIR-1-9953 SMFLR-1-9953 SMFXLR-1-9953	Upper and lower[4]	—	—	—	1-6, 11-16
AXSM-2-622-E[4]	2-port OC-12/STM-4 (622 Mbps)	SMFIR-1-622/C SMFLR-1-622/C	Upper and lower	—	1–6, 9–14	1–6, 9–14	—
AXSM-4-622[4]	4-port OC-12	SMFIR-2-622 SMFLR-2-622	Upper and lower	—	1–6, 9–14	—	—
AXSM-4-622/B[4]	4-port OC-12	SMFIR-2-622/B SMFLR-2-622/B	Upper and lower	—	1–6, 9–14	1–6, 9–14	1-6, 11-16[4]
AXSM-4-2488-XG[4]	4 port OC-48/STM-16 (clear or channelized to DS3)	SMFSR-4-2488-SFP This card supports the following FRUs: • SMFSR-1-2488-SFP • SMFLR-1-2488-SFP	Upper and lower[4]	—	—	—	1-6, 11-16
AXSM-8-155-E[4]	8-port OC-3/STM-1 (155 Mbps)	MMF-4-155-MT/B SMFIR-4-155-LC/B SMFLR-4-155-LC/B SMB-4-155	Upper and lower	—	1–6, 9–14	1–6, 9–14	—
AXSM-16-155[4]	16-port OC-3	MMF-8-155-MT MMF-8-155-MT/B SMFIR-8-155-LC SMFIR-8-155-LC/B SMFLR-8-155-LC SMFLR-8-155-LC/B	Upper and lower	—	1–6, 9–14	—	—

Table 2-9 Valid Card Installation Options (continued)

Front Card Type	Description	Back Card Types	Valid Back Card Bay Locations	MGX 8830 Valid Slot Numbers	MGX 8850 Valid Slot Numbers	MGX 8880 Valid Slot Numbers	MGX 8950 Valid Slot Numbers
AXSM-16-155/B[4]	16-port OC-3	SMB-4-155 MMF-8-155-MT/B SMFIR-8-155-LC/B SMFLR-8-155-LC/B	Upper and lower	—	1–6, 9–14	1–6, 9–14	1-6, 11-16
AXSM-16-155-XG[4]	16-port OC-3	MCC-8-155 SFP-8-155 The SFP-8-155 card supports the following FRUs: • SMFIR-1-155-SFP • SMFLR-1-155-SFP	Upper and lower	—	1–6, 9–14	—	1-6, 11-16
AXSM-16-T3E3[4]	16-port T3/E3	SMB-8-T3 SMB-8-E3	Upper and lower	—	1–6, 9–14	—	—
AXSM-16-T3E3/B[4]	16-port T3/E3	SMB-8-T3 SMB-8-E3	Upper and lower	—	1–6, 9–14	1–6, 9–14	1-6, 11-16
AXSM-16-T3E3-E[4]	16-port T3/E3	SMB-8-T3 SMB-8-E3	Upper and lower	—	1–6, 9–14	1–6, 9–14	—
AXSM-32-T1E1-E[4]	32-port T1/E1	MCC8-16-E1 RBBN8-16-T1E1	Upper and lower	—	1–6, 9–14	1–6, 9–14	—
CESM-8E1	8 port Circuit Emulation Service Module with E1 interfaces	RJ48-8E1 R-RJ48-8E1 MGX-RJ48-8E1[1] SMB-8E1 R-SMB-8E1	Upper and lower	3-6, 10-13	1-6, 9-14, 17-22, 25-30	—	—
CESM-8T1 CESM-8T1/B	8 port Circuit Emulation Service Module with T1 interfaces	RJ48-8T1 R-RJ48-8T1	Upper and lower	3-6, 10-13	1-6, 9-14, 17-22, 25-30[1]	—	—
FRSM-12-T3E3[4]	12-port T3/E3	SMB-6-T3E3	Upper and lower	—	1–6, 9–14	—	—
FRSM-2CT3	2 port channelized Frame Relay Service Module with T3 interfaces	MGX-BNC-2T3	Upper and lower	3-6, 10-13	1-6, 9-14, 17-22, 25-30	—	—
FRSM-8E1	8 port Frame Relay Service Modules with E1 interfaces	RJ48-8E1 MGX-RJ48-8E1[1] R-RJ48-8E1 SMB-8E1 R-SMB-8E1	Upper and lower	3-6, 10-13	1-6, 9-14, 17-22, 25-30	—	—

Table 2-9 Valid Card Installation Options (continued)

Front Card Type	Description	Back Card Types	Valid Back Card Bay Locations	MGX 8830 Valid Slot Numbers	MGX 8850 Valid Slot Numbers	MGX 8880 Valid Slot Numbers	MGX 8950 Valid Slot Numbers
FRSM-8E1-C	8 port channelized Frame Relay Service Module with E1 interfaces	RJ48-8E1 MGX-RJ48-8E1[1] R-RJ48-8E1 SMB-8E1 R-SMB-8E1	Upper and lower	3-6, 10-13	1-6, 9-14, 17-22, 25-30	—	—
FRSM-8T1	8 port Frame Relay Service Modules with T1 interfaces	RJ48-8T1 R-RJ48-8T1	Upper and lower	3-6, 10-13	1-6, 9-14, 17-22, 25-30[1]	—	—
FRSM-8T1-C	8 port channelized Frame Relay Service Module with T1 interfaces	RJ48-8T1 R-RJ48-8T1	Upper and lower	3-6, 10-13	1-6, 9-14, 17-22, 25-30[1]	—	—
FRSM-HS2/B	2 port Frame Relay Service Module with HSSI interfaces	SCS12-2HSSI/B MGX-121N1-8S	Upper and lower	3-6, 10-13	1-6, 9-14, 17-22, 25-30	—	—
MPSM-8-T1E1	8 ATM service ports with E1 interfaces	RJ48-8E1 MGX-RJ48-8E1[1] R-RJ48-8E1 SMB-8E1 R-SMB-8E1	Upper and lower	3-6, 10-13	1-6, 9-14, 17-22, 25-30	—	—
	8 ATM service ports with T1 interfaces	RJ48-8T1 R-RJ48-8T1	Upper and lower	3-6, 10-13	1-6, 9-14, 17-22, 25-30[3]	—	—
	8 Frame Relay service ports with E1 interfaces	RJ48-8E1 MGX-RJ48-8E1[1] R-RJ48-8E1 SMB-8E1 R-SMB-8E1	Upper and lower	3-6, 10-13	1-6, 9-14, 17-22, 25-30	—	—
	8 Frame Relay service ports with T1 interfaces	RJ48-8T1 R-RJ48-8T1	Upper and lower	3-6, 10-13	1-6, 9-14, 17-22, 25-30[1]	—	—
	8 circuit emulation service ports with E1 interfaces	RJ48-8E1 MGX-RJ48-8E1[1] R-RJ48-8E1 SMB-8E1 R-SMB-8E1	Upper and lower	3-6, 10-13	1-6, 9-14, 17-22, 25-30	—	—
	8 circuit emulation service ports with T1 interfaces	RJ48-8T1 R-RJ48-8T1	Upper and lower	3-6, 10-13	1-6, 9-14, 17-22, 25-30[1]	—	—

Table 2-9 Valid Card Installation Options (continued)

Front Card Type	Description	Back Card Types	Valid Back Card Bay Locations	MGX 8830 Valid Slot Numbers	MGX 8850 Valid Slot Numbers	MGX 8880 Valid Slot Numbers	MGX 8950 Valid Slot Numbers
MPSM-T3E3-155	2 port service module for ATM and Frame Relay services over OC-3 interfaces.	SFP-2-155	Upper and lower	3-6, 10-13	1-6, 9-14, 17-22, 25-30	—	—
	2 port service module for ATM and Frame Relay services over OC-3 electrical interfaces.	SMB-2-155-EL	Upper and lower	3-6, 10-13	1-6, 9-14, 17-22, 25-30	—	—
	3 port service module for ATM and Frame Relay services over T3 and E3 electrical interfaces.	BNC-3-T3E3	Upper and lower	3-6, 10-13	1-6, 9-14, 17-22, 25-30	—	—
PXM1E-4-155[4]	Processor Switch Module 4-port OC-3	PXM-UI-S3/B	Upper	1 and 2	7 and 8	—	—
		MMF-4-155/C SMFIR-4-155/C SMFLR-4-155/C	Lower				
PXM1E-8-155[4]	Processor Switch Module 8-port OC-3	PXM-UI-S3/B	Upper	1 and 2	7 and 8	—	—
		SFP-8-155 MCC-8-155 Transceivers: • MMF-1-155-SFP • SMFLR-1-155-SFP • SMFIR-1-155-SFP	Lower				
PXM1E-8-T3E3[4]	Processor Switch Module 8-port T3/E3	PXM-UI-S3/B	Upper	1 and 2	7 and 8	—	—
		SMB-8-T3 SMB-8-E3	Lower				
PXM1E-16-T1E1[4]	Processor Switch Module 16-port T1/E1	PXM-UI-S3/B	Upper	1 and 2	7 and 8	—	—
		MCC-16-E1 RBBN-16-T1E1	Lower				

Table 2-9 Valid Card Installation Options (continued)

Front Card Type	Description	Back Card Types	Valid Back Card Bay Locations	MGX 8830 Valid Slot Numbers	MGX 8850 Valid Slot Numbers	MGX 8880 Valid Slot Numbers	MGX 8950 Valid Slot Numbers
PXM1E-COMBO[4]	Processor Switch Module 4-port OC-3, 8-port T3/E3	PXM-UI-S3/B	Upper	1 and 2	7 and 8	—	—
		MGX-T3E3-155 Transceivers: • MMF-1-155-SFP • SMFLR-1-155-SFP • SMFIR-1-155-SFP	Lower				
PXM45[4]	Processor Switch Module	PXM-UI-S3	Upper	—	7 and 8	—	—
		PXM Hard Disk Drive	Lower				
PXM45/B[4]	Processor Switch Module	PXM-UI-S3	Upper	—	7 and 8	—	7 and 8
		PXM Hard Disk Drive	Lower				
PXM45/C[4]	Processor Switch Module	PXM-UI-S3	Upper	—	7 and 8	7 and 8	7 and 8
		PXM Hard Disk Drive	Lower				
RPM-PR-256[4] RPM-PR-512[4]	Route Processor Module	MGX-RJ45-4E/B MGX-RJ45-FE MGX-MMF-FE	Upper and lower	3-6	1-6, 9-14	—	1-6, 11-16
RPM-XF-512[4]	Route Processor Module	Upper Bay: • MGX-XF-UI Lower Bay: • MGX-1OC12POS-IR • MGX-1GE (with transceiver.) **Note** Back cards are optional with the RPM-XF.	Upper and lower	—	1-6, 9-14	9-14	1-6, 11-16
SRM-3T3/C	3 port Service Redundancy Module with T3 interfaces	BNC-3T3-M	Upper and lower	7 and 14	15,16, 31, 32	—	—
SRME	1 port Service Redundancy Module with SONET or SDH interfaces	MGX-SMFIR-1-155 MGX-STM1-EL-1	Upper and lower	7 and 14	15,16, 31, 32	—	—

Table 2-9 Valid Card Installation Options (continued)

Front Card Type	Description	Back Card Types	Valid Back Card Bay Locations	MGX 8830 Valid Slot Numbers	MGX 8850 Valid Slot Numbers	MGX 8880 Valid Slot Numbers	MGX 8950 Valid Slot Numbers
SRME/B	1 or 3 port Service Redundancy Module with T3, SONET, or SDH interfaces	MGX-SMFIR-1-155 MGX-STM1-EL-1 BNC-3T3-M	Upper and lower	7 and 14	15,16, 31, 32	15,16, 31, 32	—
VISM-PR-8E1	8-port E1 Voice Internetworking Service Module	AX-SMB-8E1 AX-R-SMB-8E1 AX-RJ48-8E1 AX-R-RJ48-8E1 MGX-RJ48-8E1[1]	Upper and lower	3-6, 10-13	1-6, 9-14, 17-22, 25-30	17-22, 25-30	—
VISM-PR-8T1	8-port T1 Voice Internetworking Service Module	AX-RJ48-8T1 AX-R-RJ48-8T1	Upper and lower	3-6, 10-13	1-6, 9-14, 17-22, 25-30	17-22, 25-30	—
VXSM-4-155[4]	4-port OC-3 Voice Switch Service Module	VXSM-BC 4-155	Upper and lower[5]	—	1-6, 9-14	1-6, 9-14	—
VXSM-48-T1E1[4]	48-port T1 and E1 Voice Switch Service Module	VXSM-BC 24-T1/E1 VXSM-BC R	Upper and lower	—	1-6, 9-14	1-6, 9-14	—
XM60	Switch Module 60 60 Gbps switch fabric	none	none	—	—	—	9, 10, 25, 26

1. This card is for use in Australia.
2. Not supported on MGX 8850 (PXM45).
3. SRM-3T3 does not support bulk distribution to 8-port T1 cards in slots 9, 10, 25, and 26. If SRM-3T3 and SRME/B with a T3 interface coexist in the same bay, bulk distribution for 8-port T1 cards in these slots is not supported. If a SRME/B with a T3 interface is replaced with an SRM-3T3, bulk distribution for 8-port T1 cards in these slots is not supported.
4. Double-height card.
5. A VXSM back card is installed in the lower bay only when intracard APS is in use.

CHAPTER 3

Provisioning PXM1E Communication Links

This chapter describes how to prepare PXM1E lines for physical connectivity to other switches. It describes how to add ports and connections that support ATM communications over the PXM1E lines to other devices.

This chapter provides a quickstart procedure for configuring PXM1E cards and lines and describes how to provision the link and connection types listed in Table 3-1.

Note The procedures in this chapter do not apply to the Cisco MGX 8850 (PXM45) or to the Cisco MGX 8950. PXM45 cards do not provide ATM lines. Cisco MGX 8850 (PXM45) and Cisco MGX 8950 switches support ATM communication on the AXSM card.

Table 3-1 PXM1E Link and Connection Types

PXM1E Link or Connection Type	Description
PNNI trunks	PNNI trunks connect MGX switches to other MGX switches.
PNNI UNI ports	PNNI user-network interface (UNI) ports connect MGX switches to CPE.
SVCs[1]	SVCs are temporary connections that are brought up and torn down upon request from CPE.
SPVCs[2]	SPVCs are permanent connections that can be rerouted if a link fails.
PNNI virtual trunks	PNNI virtual trunks are used to traverse public networks. The virtual trunk endpoints are on separate networks, but the path between the networks is treated like a single link.
Cisco MGX 8850 (PXM1) feeder PNNI trunks	Feeder trunks link a feeder switch, such as a Cisco MGX 8230 or Cisco MGX 8250 switch, to a Cisco MGX 8850 Release 5 switch. The feeder switch concatenates relatively low speed traffic and feeds it over a higher speed interface to the Cisco MGX 8850 switch, which provide the link to the ATM network core.
BPX PNNI trunks	BPX PNNI trunks provide PNNI links between MGX 8850 switches and BPX switches that support PNNI. The BPX switch supports PNNI when connected to the *Cisco SES PNNI Controller.*
AINI[3] links	AINI links enable connectivity between two independent PNNI networks and block the PNNI database exchange so the two networks remain independent.

Table 3-1 PXM1E Link and Connection Types (continued)

PXM1E Link or Connection Type	Description
IISP[4] links	IISP links enable connectivity between two independent PNNI networks and block the PNNI database exchange so the two networks remain independent. IISP is the predecessor to AINI and should be used only when AINI is not supported on one or both ends of the link.
XLMI[5] links	XLMI links connect PNNI networks to AutoRoute networks. XLMI links enable the expansion of AutoRoute networks using PNNI, and they facilitate migration from AutoRoute networking to PNNI.

1 SVC = switched virtual circuits

2 SPVC = soft permanent virtual circuit

3 AINI = ATM Inter-Network Interface

4 IISP = Interim Inter-Switch Protocol

5 XLMI = Extended Link Management Interface

The configuration differences between these types of connections are often as simple as an additional command or a different set of command options. To eliminate redundancy and help experienced users complete configuration procedures quickly, this chapter uses configuration quickstarts and task descriptions to explain how to configure connections.

The first time you configure a connection type, use the quickstart procedure to see the order of tasks to complete, and then read the task descriptions for detailed instructions.

Note For all commands in this chapter, refer to the *Cisco MGX 8850 (PXM45/PXM1E), Cisco MGX 8950, Cisco MGX 8830, and Cisco MGX 8880 Command Reference, Release 5* for detailed information.

Note Before you start configuring ATM connections, complete the general switch configuration as described in Chapter 2, “Configuring General Switch Features.” Some of the procedures described in this chapter will not work if the switch has not been set up properly.

Quickstart Provisioning Procedures

The following sections present abbreviated procedures that you can use to configure lines and provision connections.

Line Configuration Quickstart

The quickstart procedure in this section provides a summary of the tasks required to prepare PXM1E cards and lines for configuration as ATM trunks and lines. This procedure is provided as an overview and as a quick reference for those who already have configured Cisco MGX 8850 (PXM1E) and Cisco MGX 8830 switches.

	Command	Purpose
Step 1	*username* <*password*>	Start a configuration session. **Note** To perform all the steps in this quickstart procedure, you must log in as a user with GROUP1 privileges or higher.
Step 1	**cnfcdmode** <*mode*>	Configure the operational mode of all lines on PXM1E cards that support T1, E1, T3 or E3 lines. This step selects either T1 or E1, or either T3 or E3, depending on the card type. **Note** You need to configure the card mode before you provision connections on the PXM1E card.
Step 2	**upln** <*bay.line*> Related commands: **dsplns** **dspln** -*type* <*bay.line*>	Bring up and configure lines. This step establishes physical layer connectivity between two switches. See the "Setting Up Lines" section later in this chapter.
Step 3	**cnfln** <*options*> Related commands: **dsplns** **dspln** -*type* <*bay.line*>	Configure lines if the default configuration parameters must be changed. See the "Configuring Lines" section later in this chapter.
Step 4	**addapsln** <*workingIndex*> <*protectIndex*> <*archmode*> **dspapslns** **dspapsln** *working-slot.bay.line*>	Configure a redundant relationship between two PXM1E lines. See the "Establishing Redundancy Between Two Lines with APS" section later in this chapter.

ATM Trunk Configuration Quickstart

ATM trunks connect the switch to other ATM switches in the core ATM network. The quickstart procedure in this section provides a summary of the tasks required to configure ATM trunks on Cisco MGX switches. This procedure is a quick reference for those who have previously configured these types of connections.

Note The trunk configuration is not complete until the following procedure has been completed on the switches at both ends of the trunk.

	Command	Purpose
Step 1	*username* <*password*>	Start a configuration session. **Note** To perform all the steps in this quickstart procedure, you must log in as a user with GROUP1 privileges or higher.
Step 2		Bring up PXM1E lines as described in the "Line Configuration Quickstart," which appears earlier in this chapter.

	Command	Purpose
Step 3	**addport** <*options*> or **addimagrp** <*options*> **addimalnk** <*options*> **addimaport** <*options*> Related commands: **dspports** **dspimalnk** **dspimalnks** **dspimagrp** **dspimagrps**	Add and configure ATM ports. This step establishes ATM layer two communications between two ATM devices. **Note** The PNNI or MPLS controller must be added before adding ports for ATM trunks. Procedures for adding controllers can be found in Chapter 2, "Configuring General Switch Features." Specify NNI for interswitch trunks. For standard port configuration, see the "Adding ATM Ports" section later in this chapter. If you want to configure ATM communications over an IMA group, see the "Configuring Inverse Multiplexing for ATM" section later in this chapter.
Step 4	**cnfport** <*options*> Related commands: **dspport** **dspports**	Use this optional step if you need to make changes to the port created in the previous step. For more information on modifying ports, see the "Modifying ATM Ports" section later in this chapter.
Step 5	**addpart** <*options*> Related commands: **dspparts** **dsppart** **cnfpart**	Assign trunk resources to PNNI controllers. This step can assign all the trunk bandwidth to a single controller, or it can assign portions of the trunk bandwidth to each controller. See the "Partitioning Port Resources Between Controllers" section later in this chapter.
Step 6	**dnpnport** <*portid*> **cnfpnportsig** <*options*> **uppnport** <*portid*> Related commands: **dsppnports** **dsppnport** <*portid*> **dsppnportsig** <*portid*>	Define the signaling protocol used on the trunk. The default signaling protocol is *UNI none*. Specify **pnni10** for PNNI trunks. See the "Selecting the Port Signaling Protocol" section later in this chapter.

	Command	Purpose
Step 7	**dsppnni-link** **dsppnni-neighbo**r	When both ends of the link are configured, verify the PNNI communications between the two ends. In the **dsppnni-link** report, there should be an entry for the port for which you are verifying communications. The Hello state reported should be twoWayInside, and the Remote node ID should display the remote node ATM address after the second colon. See the "Verifying PNNI Trunk Communications" section later in this chapter.
Step 8	**upilmi** <*ifNum*> <*partId*> **cnfilmi** <*options*> Related commands: **dspports** **dspilmis**	This optional step configures and starts the integrated local management interface (ILMI) protocol on trunks where you want to support Cisco WAN Manager or use ILMI features. See the "Configuring ILMI on a Port" section later in this chapter.

After you configure an PXM1E trunk, the trunk is ready to support SVCs. You can also create SPVCs and SPVPs between CPE at each end of the trunk as described in "Provisioning and Managing SPVCs and SPVPs," which appears later in this chapter.

PNNI UNI Port Configuration Quickstart

ATM UNI ports connect the switch to ATM end devices, which serve as the boundary between the ATM network and other communications paths or networks. Typical end devices include ATM routers and multiservice concentrators. UNI signaling is used between the end system (CPE) and the PNNI network for requesting calls.

The quickstart procedure in this section provides a summary of the tasks required to configure UNI ports on Cisco MGX 8850 (PXM1E) and Cisco MGX 8830 switches. This procedure is provided as an overview and as a quick reference for those who have previously configured UNI ports.

Note The link configuration is not complete until the equipment at both ends of the line has been configured with compatible configuration settings.

	Command	Purpose
Step 1	*username* <*password*>	Start a configuration session. **Note** To perform all the steps in this quickstart procedure, you must log in as a user with GROUP1 privileges or higher.
Step 2		Bring up a PXM1E line for connection to an ATM end device as described in the "Line Configuration Quickstart," which appears earlier in this chapter.

	Command	Purpose
Step 3	**addport** <*options*> or **addimagrp** <*options*> **addimalnk** <*options*> **addimaport** <*options*> Related commands: **dspports** **dspimalnk** **dspimalnks** **dspimagrp** **dspimagrps**	Add and configure ATM ports. This step establishes ATM layer two communications between two ATM devices. **Note** The PNNI or MPLS controller must be added before adding UNI ports. Procedures for adding controllers can be found in Chapter 2, "Configuring General Switch Features." Specify UNI for ATM lines. For standard port configuration, see the "Adding ATM Ports" section later in this chapter. If you want to configure ATM communications over an IMA group, see the "Configuring Inverse Multiplexing for ATM" section later in this chapter.
Step 4	**addpart** <*options*> Related commands: **dspparts** **dsppart** **cnfpart**	Assign line resources to the PNNI controllers. This step can assign all the line bandwidth to a single controller, or it can assign portions of the line bandwidth to each controller. See the "Partitioning Port Resources Between Controllers" section later in this chapter.
Step 5	**dnpnport** <*portid*>	Bring down the port so it can be configured. The next three steps require this step.
Step 6	**cnfpnportsig** <*options*> Related commands: **dsppnports** **dsppnport** <*portid*> **dsppnportsig** <*portid*>	Define the signaling protocol used on the line. The default signaling protocol for UNI lines is *UNI none*. Specify **uni30**, **uni31**, or **uni40**. See the "Selecting the Port Signaling Protocol" section later in this chapter.
Step 7	**cnfaddrreg** <*portid*> no **addaddr** <*options*> Related commands: **dsppnports** **dspatmaddr** <*portid*> **deladdr** <*options*>	If required, configure static ATM addresses for the PXM1E UNI port. See the "Assigning Static ATM Addresses to Destination Ports" section later in this chapter.
Step 8	**addprfx** <*portid*> *atm-prefix* Related commands: **cnfaddrreg** <*portid*> yes **dspprfx** <*portid*>	If dynamic addressing is to be used on a port, define an ATM address prefix that ILMI can use when assigning addresses. See the "Configuring ILMI Dynamic Addressing" section later in this chapter.

	Command	Purpose
Step 9	**uppnport** <*portid*>	Bring up the port after configuration is complete.
Step 10	**upilmi** <*ifNum*> <*partId*> **cnfilmi** <*options*> Related commands: **dspports** **dspilmis**	Configure and start ILMI on the port. This step is required for dynamic addressing and the ILMI automatic configuration feature. Otherwise, it is optional. See the "Configuring ILMI on a Port" section later in this chapter.

SVC Configuration Quickstart

Switched virtual circuits (SVCs) are the solution for on-demand connections. They are set up as needed and torn down when no longer needed. To enable this dynamic activity, SVCs use signaling. End systems request connectivity to other end systems and, provided that the requested services are available, the connection is set up at the time of the request. When idle, an SVC is taken down to save network bandwidth.

Cisco MGX 8850 (PXM1E) and Cisco MGX 8830 switches can use the PNNI protocol to determine how to set up SVCs through the network. Because the switch automatically sets up SVCs, you do not have to configure SVC routes. However, the switch must be configured correctly before it can set up SVCs. The following quickstart procedure summarizes the tasks required to enable SVC communications. With the exception of CPE configuration, all these tasks are described in this chapter.

Note The tasks in the following procedure do not have to be completed in the order presented. However, all tasks must be completed before SVCs will operate.

	Command	Purpose
Step 1	See the "ATM Trunk Configuration Quickstart" section earlier in this chapter.	Configure the trunks that link the switches through which the ATM end stations connect. Be sure to add the PNNI controller on each switch and select that controller when partitioning trunks.
Step 2	**dsppnni-reachable-addr network**	Verify connectivity between the node pairs that will host SVCs. See the "Verifying End-to-End PNNI Communications" section later in this chapter.
Step 3	See the "PNNI UNI Port Configuration Quickstart" section earlier in this chapter.	Configure UNI ports for the ATM end stations at each end of the SVC, and assign either static or dynamic addressing to each line. Be sure to add the PNNI controller on each switch and select that controller when partitioning trunks.
Step 4	See the CPE documentation.	Configure CPE devices for communications with the switch through the UNI ports configured in the previous step.
Step 5	**dsppncons**	This optional step displays the SVC connections that are operating. See the "Displaying SVCs" section in Chapter 9, "Switch Operating Procedures."

It is beyond the scope of this guide to describe how to configure each model of the CPE to communicate with the switch. To complete this configuration, you will need to learn the capabilities of the CPE and the switch and define a set of communications parameters that are supported by both devices. For example, the Cisco MGX switches support UNI 3.1 communications, but if the CPE does not, you must select a signaling protocol (such as UNI 3.0) that is supported by both devices.

Once all the requirements have been met for SVC connections, CPE devices can establish SVC connections to other CPE devices on the same switched network.

SPVC and SPVP Configuration Quickstart

A soft permanent virtual circuit (SPVC) is a permanent virtual circuit (PVC) that can be rerouted using the Private Network-to-Network Interface (PNNI) Version 1.0 protocol. As with PVCs, SPVCs are full-time connections. A PVC, however, uses a predefined circuit path and will fail if the path is interrupted. Using the PNNI protocol, SPVCs can be rerouted to avoid failed communication links or to use links that offer better bandwidth.

An SPVP is a permanent virtual path that can be rerouted using the PNNI Version 1.0 protocol. The difference between an SPVC and an SPVP is that the SPVP supports multiple VCIs, whereas an SPVC is by definition a single virtual circuit. As with SPVCs, when an SPVP fails, PNNI can determine if an alternate route exists and reroute the connection.

The quickstart procedure in this section provides a summary of the tasks required to configure SPVCs and SPVPs on Cisco MGX 8850 (PXM1E) and Cisco MGX 8830 switches. This procedure is provided as an overview and as a quick reference for those who have previously configured these types of connections.

	Command	Purpose
Step 1	*username* *<password>*	Start a configuration session. **Note** To perform all the steps in this quickstart procedure, you must log in as a user with GROUP1 privileges or higher.
Step 2	See "ATM Trunk Configuration Quickstart," which appears earlier in this chapter.	Configure the trunks that link the switches to which the ATM end stations connect.
Step 3	**dsppnni-reachable-addr network**	Verify PNNI connectivity between the two nodes that will host the SPVC or SPVP end points. See "Verifying End-to-End PNNI Communications," which appears later in this chapter.
Step 4	See "PNNI UNI Port Configuration Quickstart," which appears earlier in this chapter.	Configure lines for the ATM end stations at each end of the SPVC or SPVP, and assign either static or dynamic addressing to each line.

	Command	Purpose
Step 5	**addcon** <*options*> Related commands: **dspcons** **dspcon** <*ifNum*> <*vpi*> <*vci*>	Configure the slave side of the connection. See "Configuring the Slave Side of SPVCs and SPVPs," which appears later in this chapter.
Step 6	**addcon** <*options*> Related commands: **dspcons** **dspcon** <*ifNum*> <*vpi*> <*vci*>	Configure the master side of the connection. See "Configuring the Master Side of SPVCs and SPVPs," which appears later in this chapter.

PNNI Virtual Trunk Configuration Quickstart

Virtual trunks are introduced in the "Multiservice Edge Aggregation" section in Chapter 1, "Preparing for Configuration." Figure 3-1 shows illustrates how a virtual trunk is configured.

Figure 3-1 Virtual Trunk Topology

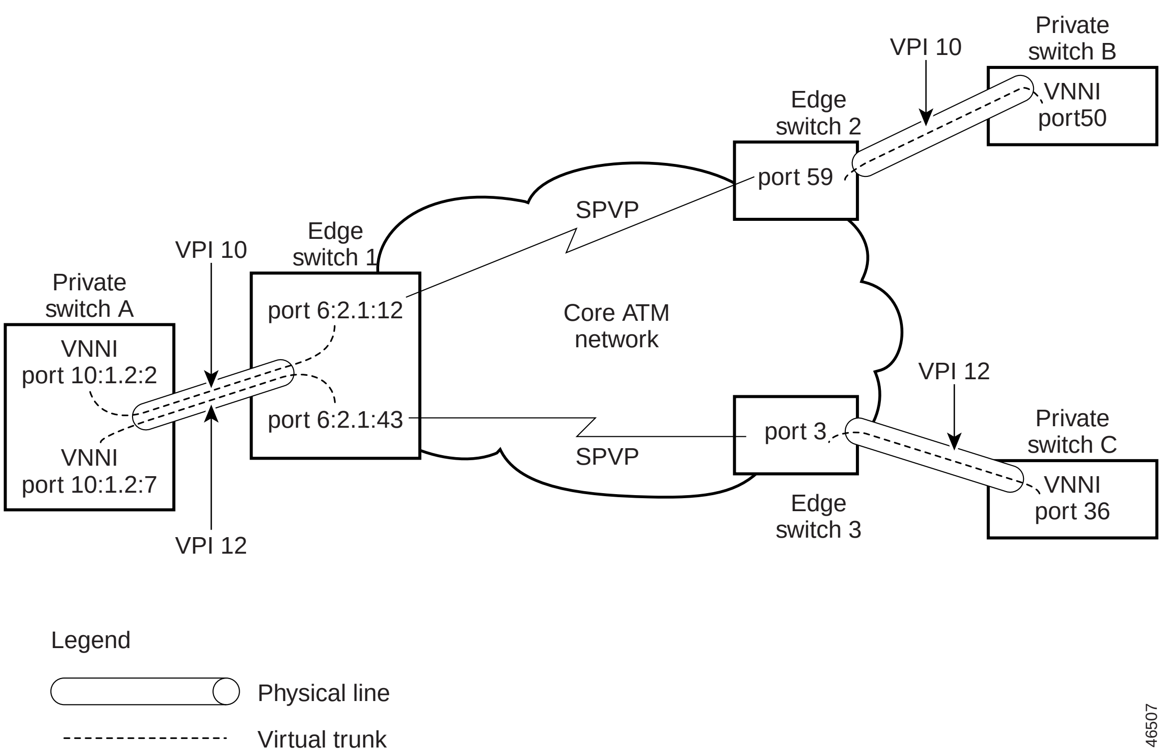


Figure 3-1 shows an example of configuration data that you can use when following the quickstart procedure below. Note that the single trunk between Private Switch A and Edge Switch 1 hosts two virtual trunks, which terminate at Virtual Network-to-Network Interface (VNNI) ports 10:1.2:2 and 10:1.2:7. The switch supports up to 32 VNNI ports on the node.

To set up a virtual trunk, the following tasks have to be completed:

- Virtual trunks must be defined between the private network nodes and the core edge nodes.
- The core network operators must define an SPVP for each virtual trunk that connects the core edge nodes on the virtual trunk path.

The Cisco MGX switches support:

- Up to 256 SPVPs across an ATM core network (or ATM cloud). The range is from 0 to 255.
- Up to 60 virtual trunks on a physical interface with a total of 60 per PXM1E card and 100 ports per switch.
- Multiple SPVPs on a virtual trunk when the EVNNI port type is selected and a range of VPIs is configured.

The following quickstart procedure provides a summary of the tasks required to configure virtual trunks on Cisco MGX switches. This procedure is provided as an overview and as a quick reference for those who have previously configured these types of connections.

	Command	Purpose
Step 1	*username* <*password*>	Start a configuration session on a Cisco MGX 8850 (PXM1E) or Cisco MGX 8830 switch. This will be the local routing switch that connects to the feeder. **Note** To perform all the steps in this quickstart procedure, you must log in as a user with GROUP1 privileges or higher.
Step 2		Bring up PXM1E lines as described in the "Line Configuration Quickstart," which appears earlier in this chapter.
Step 3	**addport** <*options*> or **addimagrp** <*options*> **addimalnk** <*options*> **addimaport** <*options*> Related commands: **dspports** **dspimalnk** **dspimalnks** **dspimagrp** **dspimagrps**	Configure the virtual trunk end ports at the private switches. Valid virtual trunk port types are VNNI and EVNNI. For standard port configuration, see the "Adding ATM Ports" section later in this chapter. If you want to configure ATM communications over an IMA group, see the "Configuring Inverse Multiplexing for ATM" section later in this chapter.

	Command	Purpose
Step 4	**addpart** *<options>* Related commands: **dspparts** **dsppart** **cnfpart**	Configure the virtual trunk partitions at the private switches. For a VNNI port, enter the same VPI number for the minVpi and maxVpi parameters. This number becomes the VPI number for the virtual trunk. For an EVNNI port, enter the same minimum and maximum VPI numbers you entered when creating the port. This range becomes the VPI number range for the virtual trunk. See the "Partitioning Port Resources Between Controllers" section later in this chapter.
Step 5	**dnpnport** *<portid>* **cnfpnportsig** *<options>* **uppnport** *<portid>* Related commands: **dsppnports** **dsppnport** *<portid>* **dsppnportsig** *<portid>*	Configure the virtual trunk signaling at the private switches. Select PNNI signaling by setting the **-nniver** option to **pnni10**. `pop20two.7.PXM.a > cnfpnportsig <portid> -nniver pnni10` See the "Selecting the Port Signaling Protocol" section later in this chapter.
Step 6	**addport** *<options>* or **addimagrp** *<options>* **addimalnk** *<options>* **addimaport** *<options>* Related commands: **dspports** **dspimalnk** **dspimalnks** **dspimagrp** **dspimagrps**	Add and configure the virtual trunk end ports at each core edge node. Specify interface type **1** for UNI or **2** for NNI. See the "Adding ATM Ports" section later in this chapter. If you want to configure ATM communications over an IMA group, see the "Configuring Inverse Multiplexing for ATM" section later in this chapter.
Step 7	**addpart** Related commands: **dspparts** **dspparts** **cnfpart**	Configure the virtual trunk partitions at each core edge node. Use a VPI range that includes all VPI numbers set for virtual trunks on this line at the private switch. See the "Partitioning Port Resources Between Controllers"section in this chapter. **Note** If you plan to migrate to MPLS, do not configure the whole range of VPI/VCI. Instead, only configure as much as you need for PNNI to operate. You cannot shrink the VPI/VCI range without affecting the service of your network.

	Command	Purpose
Step 8	**dnpnport** **cnfpnportsig** **uppnport** Related commands: **dsppnports** **dsppnport** **dsppnportsig**	Configure the virtual trunk signaling at each core edge node. Select no trunk signaling by setting the **-univer** option to **none**. See the "Selecting the Port Signaling Protocol" section later in this chapter.
Step 9	**addcon** <*options*> Related commands: **dspcon** **dspcons**	For each virtual trunk, configure an SPVP between the virtual trunk ports at each edge of the core network. See the "Provisioning and Managing SPVCs and SPVPs" section in this chapter.
Step 10	**dsppnni-reachable-addr network**	Verify PNNI connectivity between the two nodes that will host the virtual trunk endpoints. See the "Verifying End-to-End PNNI Communications"section in this chapter.

BPX PNNI Trunk Configuration Quickstart

When the Cisco SES PNNI controller is attached to a Cisco BPX switch, the BPX switch can participate in a PNNI network with Cisco MGX switches. The connection between an Cisco MGX 8850 (PXM1E) switch and a BPX switch is a trunk between a PXM1E card in the MGX switch and a BXM card in the BPX. For instructions on configuring the BXM end of the trunk, refer to the Cisco SES product documentation. This section describes how to configure the PXM1E end of the trunk.

The procedure for configuring the PXM1E end of the trunk is similar to the general procedure for configuring PXM1E trunks. The following quickstart procedure is customized for setting up BPX PNNI trunks.

Note The trunk configuration is not complete until the BXM end of the trunk is configured.

Caution You need to allocate PNNI resources before you can configure a BPX PNNI trunk. To verify that the PNNI resource has been allocated on the trunk, enter the **dsprsrc** <*slot.port*> command.

	Command	Purpose
Step 1	*username* <*password*>	Start a configuration session. **Note** To perform all the procedures in this quickstart procedure, you must log in as a user with GROUP1 privileges or higher.
Step 2		Bring up PXM1E lines as described in the "Line Configuration Quickstart," which appears earlier in this chapter.

	Command	Purpose
Step 3	**addport** *<options>* Related commands: **dspports**	Add and configure ATM ports. This step establishes ATM communications between two ATM devices. Specify **NNI** for interswitch trunks. See the “Adding ATM Ports”section later in this chapter.
Step 4	**addpart** *<options>* Related commands: **dspparts** **dsppart** **cnfpart**	Add and configure a PNNI partition for the trunk. This step reserves trunk resources for the PNNI controller. See the “Partitioning Port Resources Between Controllers” section later in this chapter.
Step 5	**dnpnport** *<portid>* **cnfpnportsig** *<options>* **uppnport** *<portid>* Related commands: **dsppnports** **dsppnport** *<portid>* **dsppnportsig** *<portid>*	Define the signaling protocol used on the trunk. The default signaling protocol is UNI Version 3.1, so you must change the signaling protocol to **pnni10**. For example: `pop20two.7.PXM.a > cnfpnportsig <portid> -nniver pnni10` See the “Selecting the Port Signaling Protocol” section later in this chapter.
Step 6	**upilmi** *<ifNum> <partId>* **cnfilmi** *<options>* Related commands: **dspports** **dspilmis**	Configure and start ILMI on the trunk. ILMI is required on the BXM end of the trunk, so it must be enabled on the PXM1E side too. See the “Configuring ILMI on a Port” section later in this chapter.
Step 7	**dsppnni-link** **dsppnni-neighbor**	When both ends of the link are configured, verify the PNNI communications between the two ends. In the **dsppnni-link** report, there should be an entry for the port for which you are verifying communications. The Hello state reported should be twoWayInside and the Remote node ID should display the remote node ATM address after the second colon. See the “Verifying PNNI Trunk Communications” section later in this chapter.

After you configure a BPX PNNI trunk, the trunk is ready to support SVCs. You can also create SPVCs and SPVPs between CPE at each end of the trunk as described in the “Provisioning and Managing SPVCs and SPVPs” section later in this chapter.

AINI Link Configuration Quickstart

The quickstart procedure in this section provides a summary of the tasks required to configure ATM Inter-Network Interface (AINI) links on Cisco MGX switches. This procedure is provided as an overview and as a quick reference for those who have previously configured these types of connections.

	Command	Purpose
Step 1	*username* <*password*>	Start a configuration session. **Note** To perform all the steps in this quickstart procedure, you must log in as a user with SUPER_GP privileges or higher.
Step 2		Bring up the PXM1E line that will become the AINI trunk as described in the "Line Configuration Quickstart," which appears earlier in this chapter.
Step 3	**addport** <*options*> or **addimagrp** <*options*> **addimalnk** <*options*> **addimaport** <*options*> Related commands: **dspports** **dspimalnk** **dspimalnks** **dspimagrp** **dspimagrps**	Add and configure an ATM port for the AINI trunk. This step establishes ATM communications between two ATM devices. Specify **NNI** for interswitch trunks. For standard port configuration, see the "Adding ATM Ports" section later in this chapter. If you want to configure ATM communications over an IMA group, see the "Configuring Inverse Multiplexing for ATM" section later in this chapter.
Step 4	**addpart** <*options*> Related commands: **dspparts** **dsppart** **cnfpart**	Assign trunk resources to the PNNI controller. This step can assign all the trunk bandwidth to a single controller, or it can assign portions of the trunk bandwidth to each controller. See the "Partitioning Port Resources Between Controllers" section later in this chapter.
Step 5	**dnpnport** <*portid*> **cnfpnportsig** <*options*> Related commands: **dsppnports** **dsppnport** <*portid*> **dsppnportsig** <*portid*>	Define the signaling protocol used at the local end of the AINI trunk. The default signaling protocol is *none*. Specify **aini** for AINI trunks. For example: `8850_LA.7.PXM.a > ` **`cnfpnportsig 1:1.1:1 -nniver aini`** See the "Selecting the Port Signaling Protocol" section later in this chapter.

	Command	Purpose
Step 6	**cnfpnportsig** <*options*>	At one end of the AINI trunk, VPI and VCI allocation must be disabled. VPI and VCI allocation is enabled by default on a PXM1E trunks. To disable this feature, enter the command: `8850_LA.7.PXM.a > cnfpnportsig 1:1.1:1 -vpivcialloc disable`
Step 7	**uppnport** <*portid*>	When signaling configuration is complete, bring up the port.
Step 8	**addaddr** <*options*>	Add destination addresses to local end of the trunk. See the "Defining Destination Addresses for Static Links" section later in this chapter.
Step 9	**addaddr** <*options*>	Add static addresses to destination ports. This step is required when addresses are not dynamically assigned to the CPE at the destination ports. See the "Assigning Static ATM Addresses to Destination Ports" section later in this chapter.ater in this chapter.

IISP Link Configuration Quickstart

The quickstart procedure in this section provides a summary of the tasks required to configure Interim Inter-Switch Protocol (IISP) links on Cisco MGX switches. This procedure is provided as an overview and as a quick reference for those who have previously configured these types of connections.

Note AINI is a newer protocol that is designed to replace the function of IISP. Unless you are configuring a link with another switch that does not support AINI, you should configure an AINI link instead of an IISP link. IISP links provide fewer capabilities than AINI links. For example, IISP links cannot support UNI 4.0 connections.

	Command	Purpose
Step 1	*username* <*password*>	Start a configuration session. **Note** To perform all the steps in this quickstart procedure, you must log in as a user with SUPER_GP privileges or higher.
Step 2		Bring up the PXM1E line that will serve as the IISP trunk as described in the "Line Configuration Quickstart," which appears earlier in this chapter.

	Command	Purpose
Step 3	**addport** <*options*> or **addimagrp** <*options*> **addimalnk** <*options*> **addimaport** <*options*> Related commands: **dspports** **dspimalnk** **dspimalnks** **dspimagrp** **dspimagrps**	Add a port to the IISP trunk. This step establishes ATM communications between two ATM devices. Specify **NNI** for interswitch trunks. For standard port configuration, see the "Adding ATM Ports" section later in this chapter. If you want to configure ATM communications over an IMA group, see the "Configuring Inverse Multiplexing for ATM" section later in this chapter.
Step 4	**addpart** <*options*> Related commands: **dspparts** **dsppart** **cnfpart**	Assign trunk resources to the PNNI controller. This step can assign all the trunk bandwidth to a single controller, or it can assign portions of the trunk bandwidth to each controller. See the "Partitioning Port Resources Between Controllers" section later in this chapter.
Step 5	**dnpnport** <*portid*> **cnfpnportsig** <*options*> **uppnport** <*portid*> Related commands: **dsppnports** **dsppnport** <*portid*> **dsppnportsig** <*portid*>	Define the signaling protocol used at the local end of the IISP trunk. The default signaling protocol is *none*. Specify either **iisp30** or **iisp31** for IISP trunks. For example: `mgx8830a.1.PXM.a > cnfpnportsig 1:1.1:1 -nniver iisp31 -side [network|user]` One side of the IISP trunk must be defined as the network side and one side must be defined as the user side. The side that issues VPIs and VCIs is the network side. See the "Selecting the Port Signaling Protocol" section later in this chapter.
Step 6	**addaddr** <*options*>	Add destination addresses to each end of the trunk. See the "Defining Destination Addresses for Static Links" section later in this chapter.
Step 7	**addaddr** <*options*>	Add static addresses to destination ports. This step is required when addresses are not dynamically assigned to the CPE at the destination ports. See the "Assigning Static ATM Addresses to Destination Ports" section later in this chapter.

XLMI Link Configuration Quickstart

An Extended Link Management Interface (XLMI) link joins a PNNI network with an AutoRoute network. After you establish an XLMI link, you can configure connections that link CPE in the PNNI network with CPE in the AutoRoute network. The interconnection of PNNI and AutoRoute networks enables network expansion beyond the limits of AutoRoute and facilitates a gradual migration from an all AutoRoute network to an all PNNI network.

To establish an XLMI link, you need to do the following tasks:

1. Configure a PXM1E port for the XLMI link.
2. Configure a BXM port for the XLMI link.
3. Create a connection between a destination on the PNNI network and a destination on the AutoRoute network.

The quickstart procedure in this section describes how to configure a PXM1E port to support an XLMI link, and references the instructions for creating a connection between the PNNI and AutoRoute networks. Before you begin configuration, consider the following guidelines and limitations:

- XLMI cannot be provisioned on a port which already has connections provisioned. To change the port to XLMI, you must first delete all existing connections.
- The control VC for LMI uses VPI = 3 and VCI = 31. These numbers are not allowed on other types of connections.
- Each PXM1E card supports a maximum of 16 links to AutoRoute networks and feeder nodes.
- Each PXM1E port can support one link to an AutoRoute network, so the maximum number of links to AutoRoute networks is equal to the maximum number of physical PXM1E ports.
- XLMI links support SPVCs and SPVPs. SVCs and LVCs are not supported.
- XLMI is not supported on virtual trunks.
- The various XLMI timers are not configurable on the PXM1E. Timer configuration is done on the BPX. The values for the LMI timers on PXM1E are
  - LMI SPVC Status Enquiry Timer (T393): 10 sec
  - LMI SPVC Update Status Timer (T394): 10 sec
  - LMI Retry Timers (N394 and N395): 5 sec

The following quickstart procedure provides a summary of the tasks required to configure XLMI links on Cisco MGX 8850 (PXM1E) and Cisco MGX 8830 switches.

	Command	Purpose
Step 1	*username* <*password*>	Start a configuration session. **Note** To perform all the steps in this quickstart procedure, you must log in as a user with SUPER_GP privileges or higher.
Step 2		Bring up PXM1E lines as described in the "Line Configuration Quickstart," which appears earlier in this chapter.

	Command	Purpose
Step 3	**addport** <*options*> or **addimagrp** <*options*> **addimalnk** <*options*> **addimaport** <*options*> Related commands: **dspports** **dspimalnk** **dspimalnks** **dspimagrp** **dspimagrps**	Add and configure ATM ports. This step establishes ATM communications between two ATM devices. The PXM1E cards supports XLMI on UNI or NNI ports. For standard port configuration, see the "Adding ATM Ports" section later in this chapter. If you want to configure ATM communications over an IMA group, see the "Configuring Inverse Multiplexing for ATM" section later in this chapter.
Step 4	**addpart** <*options*> Related commands: **dspparts** **dsppart** **cnfpart**	Assign port resources to the PNNI controller. This step can assign all the port bandwidth to a single controller, or it can assign portions of the port bandwidth to each controller. See the "Partitioning Port Resources Between Controllers" section later in this chapter.
Step 5	**addlmi** <*interface*> <*type*> Related commands: **dsplmi** <*interface*>	Add LMI to the port. For example: `M8850_NY.6.PXM1E.a > addlmi 2 2` Replace the *type* variable with 2 for XLMI links. (Type 1 selects feeder operation.)
Step 6	**dnpnport** <*portid*> Related commands: **dsppnports** **dsppnport** <*portid*>	Bring down the port so it can be configured.
Step 7	**cnfpnportsig** <*options*> Related commands: **dsppnport** <*portid*> **dsppnportsig** <*portid*>	Define the signaling protocol used for the port. The default signaling protocol is UNI Version 3.1. Specify **enni** for XLMI trunks. For example: `mgx8830a.1.PXM.a >` **`cnfpnportsig 1:1.1:1 -nniver enni`** See the "Selecting the Port Signaling Protocol" section later in this chapter.

	Command	Purpose
Step 8	**uppnport** <*portid*> Related commands: **dsppnports** **dsppnport** <*portid*>	Bring up the configured port.
Step 9		If you are using CWM to manage your networks, the XLMI link should be ready to use. Use CWM to add a connection from a destination in the AutoRoute network to a destination in the PNNI network.
Step 10	**addcon** <*options*>	If you are not using CWM to manage your networks, add a connection from the XLMI link endpoint on the PXM1E to a destination on the PNNI network. **Note** The PNNI connection you create must use the same VPI and VCI as the connection defined in the AutoRoute network. See the "Provisioning and Managing SPVCs and SPVPs" section later in this chapter. **Note** Connections added with the CLI (**addcon**) command cannot be managed by CWM. If you are using CWM, create the connection with CWM. Afterwards, you can modify the connection with CWM or the CLI.
Step 11		If you are not using CWM to manage your networks, add a connection from the XLMI link endpoint on the BXM to a destination on the AutoRoute network. **Note** The AutoRoute connection you create must use the same VPI and VCI as the connection defined in the PNNI network. For more information, refer to the *Cisco BPX 8600 Series Installation and Configuration* guide.

Cisco IGX Feeder to MGX 8830 or MGX 8850 (PXM1E) Configuration Quickstart

The quickstart procedure in this section provides a summary of the tasks required to configure a feeder between a Cisco MGX 8850 (PXM1E) or Cisco MGX 8830 switch, and a Cisco IGX 8400 switch. This procedure is provided as an overview and as a quick reference for those who have previously configured these types of connections.

	Command	Purpose
Step 1	*username* <*password*>	Start a configuration session with the active PXM1E card on a Cisco MGX 8850 (PXM1E) or Cisco MGX 8830 switch. **Note** To perform all the steps in this quickstart procedure, you must log in as a user with SUPER_GP privileges or higher.
Step 2		Bring up a PXM1E line that is connected to a UXM card on a Cisco IGX 8400. See "Line Configuration Quickstart," which appears earlier in this chapter.
Step 3	**addport** or **addimagrp** **addimalnk** **addimaport** <*options*> Related commands: **dspports** **dspimalnk** **dspimalnks** **dspimagrp** **dspimagrps**	Add and configure an ATM port. This step establishes ATM communications on the PXM1E end of the line. For standard port configuration, see the "Adding ATM Ports" section later in this chapter. If you are configuring IMA on this port, see the "Configuring Inverse Multiplexing for ATM" section later in this chapter.
Step 4	**addlmi**	Designate the interface as a feeder.
Step 5	**dnpnport** <*portid*> **cnfpnportsig** <*options*> **uppnport** <*portid*> Related commands: **dsppnports** **dsppnport** <*portid*> **dsppnportsig** <*portid*>	Define the signaling protocol used at the PXM1E end of the trunk. For example: `mgx8830a.1.PXM.a > cnfpnportsig 1:1.1:1 -ctlvc ip` See the "Selecting the Port Signaling Protocol" section later in this chapter.
Step 6	*username* <*password*>	Start a configuration session with the UXM card on a Cisco IGX 8400 switch. **Note** To perform all the steps in this quickstart procedure, you must log in as a user with SUPER_GP privileges or higher.
Step 7	**cnfswfunc** **uptrk** **cnftrk**	Configure the trunk on the IGX switch. The configuration on the UXM end of the trunk must match the configuration on the PXM1E end of the trunk.

General PXM1E Configuration Procedures

This section describes the following general procedures for configuring PXM1E card communications:

- Configuring the Card Mode
- Setting Up Lines
- Configuring Inverse Multiplexing for ATM
- Establishing Redundancy Between Two Lines with APS
- Adding ATM Ports
- Partitioning Port Resources Between Controllers
- Selecting the Port Signaling Protocol
- Defining Destination Addresses for Static Links
- Assigning Static ATM Addresses to Destination Ports
- Configuring ILMI on a Port
- Configuring PXM1E Line Clock Sources
- Verifying PNNI Communications
- Provisioning and Managing SPVCs and SPVPs
- Configuring and Managing a Connection to an IGX Feeder

Configuring the Card Mode

Enter the **cnfcdmode** <*mode*> command at the active PXM1E to configure the operational mode of all lines on a PXM1E-16-T1E1 or PXM1E-COMBO card.

If you are configuring a PXM1E-16-T1E1 card, replace <*mode*> with one of the following:

- **1** to specify all lines as T1 lines
- **2** to specify all lines as E1 lines

If you are configuring a PXM1E-COMBO card, replace <*mode*> with one of the following:

- **3** to specify all T3/E3 lines as T3 lines
- **4** to specify all T3/E3 lines as E3 lines

Note You cannot change the card mode once the card has been configured. The **cnfcdmode** command does not apply to the OC3c/SDH or higher speed lines. This command does not apply to PXM1E-8-T3E3 cards because the installed back card determines if all ports are T3 or E3.

In the following example, the user configures all lines on the PXM1E-COMBO back card (MGX-T3E3-155) to operate as E3 lines.

```
Unknown.7.PXM.a > cnfcdmode 4
```

To verify the card's operational mode, enter the **dsplns** command. The configured mode is displayed in the Line Type column. For example, if the card mode is set to support T3 lines, the line type is *ds3cbitadm*. If the card mode is set to support E3 lines, the line type is *e3g832adm*.

Setting Up Lines

The first step in configuring PXM1E lines is to define the physical lines that are connected to the switch. The following sections describe how to do the following tasks:

- Bring up lines
- Configure lines
- Verify the configuration of lines

Bringing Up Lines

Installing an PXM1E card can add from 1 to 16 lines to your switch. You must bring up a line before you can configure the line or provision services on the line.

Note Before bringing up lines, be sure that the proper cables and any required APS connectors are installed. For planning information regarding card and line redundancy, or for information on connecting physical lines and APS connectors, refer to the *Cisco MGX 8850 (PXM1E/PXM45), Cisco MGX 8950, Cisco MGX 8830, and Cisco MGX 8880 Hardware Installation Guide, Releases 2 Through 5*.

Before a line is brought up, or after it is brought down, the switch does not monitor the line. The PXM1E port status light for the line is unlit, and all line alarms are cleared.

When you bring up a line, the switch starts monitoring the line. The PXM1E port status light is green when physical layer communications are established with a remote switch. If physical layer communications problems are detected, the port status light turns red, and alarms are reported.

Note APS protection lines for intracard redundancy should be left down. APS automatically brings up each line at the appropriate time. For information on configuring APS lines, see the "Establishing Redundancy Between Two Lines with APS" section later in this chapter.

Tip Line alarms exist until the line is activated at both ends To minimize the number of alarms and failed port LEDs (which display red), keep lines down until they are ready for operation.

To bring up a line on the switch, use the following procedure.

Step 1 Establish a configuration session using a user name with GROUP1 privileges or higher.

Step 2 Select the card on which you want to bring up a line with the **cc** command.

```
mgx8850a.6.CESM.a > cc <slotnumber>
```

Replace <*slotnumber*> with the number of the slot in which the PXM1E card is installed. Valid slot numbers are 7 or 8 on the MGX 8850, and 1 or 2 on the MGX 8830. Verify your card selection by viewing the switch prompt, which should list the slot number and the PXM1E card type.

Step 3 Enter the **upln** command after the switch prompt.

```
mgx8850a.8.PXM.a > upln <2.line>
```

The number two specifies bay 2, which is the only bay in which PXM1E lines are available. Replace <*line*> with the number that corresponds to the line you want to bring up.

Tip If the **upln** command fails for a line that requires a field replaceable unit (FRU) transceiver, enter the **dsplns** command and verify that the Line Type column for the specified line has an entry that indicates what type of FRU transceiver is installed. If no transceiver is installed, the line cannot be brought up.

Step 4 To verify that a line has been brought up, enter the following command:

```
mgx8830b.2.PXM.a > dsplns
```

The line state column shows whether each line is up or down as shown in the following example:

```
mgx8830b.2.PXM.a > dsplns
                                           Medium Medium
  Sonet         Line     Line      Line    Frame   Line    Line    Valid   Alarm  APS
  Line          State    Type      Lpbk   Scramble Coding  Type    Intvls  State  Enabled
  ------------- ----- ------------ ------ -------- ------ -------- ------ ------- -------
   2.1 Adj APS     Up   sonetSts3c NoLoop   Enable    NRZ ShortSMF     72  Clear  Enable
   2.2           Down   sonetSts3c NoLoop   Enable    NRZ ShortSMF      0  Clear Disable
   2.3             Up   sonetSts3c NoLoop   Enable    NRZ ShortSMF     72  Clear Disable
   2.4           Down   sonetSts3c NoLoop   Enable    NRZ ShortSMF      0  Clear Disable
   2.1             Up   sonetSts3c NoLoop   Enable    NRZ ShortSMF     72  Clear  Enable
```

The line state represents the administrative intent for the line. For example, a line is reported as Down until an administrator brings up the line. Once the administrator brings up the line, the line state remains Up until the administrator brings the line down with the **dnln** command.

The alarm state indicates whether the line is communicating with a remote switch. When the alarm state is reported as Clear, the physical devices at each end of the line have established physical layer communications.

Configuring Lines

All line types are brought up with a default configuration. When configuring trunks between switches, you can accept the defaults for each line and thus minimize configuration time. If you modify line characteristics, make sure the parameter values are the same at both ends of the line.

Use the **cnfln** command to modify a line's configuration. Table 3-2 describes the parameters you can configure for each line type, and the following subsections describe how to enter the **cnfln** command for each line type.

Table 3-2 Parameters for cnfln Command

Parameter	Line Types Supported	Description
AIScBitsCheck	T3	The **-cb** option defines C-bit checking. Set <*AIScBitsCheck*> to **1** to enable C-bit checking. Set it to **2** to ignore the C-bit.
bay.line	T1 E1 T3 E3 SONET	Replace *bay* with **2** to specify that the line is connected to a PXM1E back card in the uplink bay. Replace *line* with the number that corresponds to the line you want to configure.

Table 3-2 Parameters for cnfln Command (continued)

Parameter	Line Types Supported	Description
clockSource	T1 E1 T3 E3 SONET	The **-clk** option selects the source timing for transmitting messages over the line. Replace <*clockSource*> with **1** to use the clock signal received over this line from a remote node, or specify **2** to use the local timing defined for the local switch.
LineLength	T1 T3	The **-len** option specifies the length of a line from the local node to a remote node in meters. Enter a value from 0 to 64000 meters.
LineType	SONET	Enter **-slt 1** for SONET or **-slt 2** for SDH.
LineType	T3	Enter **-lt 1** for ds3cbitadm or **-lt 2** for ds3cbitplcp.
OOFCriteria	T3	Out of Frame (OOF) alarm criteria. Replace <*OOFCriteria*> with **1** to select 3 out of 8 and **2** to select 3 out of 16.
RcvFEACValidation	T3	Replace <*RcvFEACValidation*> with **1** to select 4 out of 5 and **2** to select 8 out of 10.

Configuring T1 (DS1) Lines

At the physical level, you can configure the length and the clock source for T1 lines. The following procedure describes how to configure T1 lines.

Note T1 lines are also called DS1 lines in the CLI.

Step 1 Establish a configuration session using a user name with GROUP1 privileges or higher.

Step 2 If you do not know the line number you want to configure, enter the **dsplns** command to display a list of the lines:

```
mgx8830b.2.PXM.a > dsplns
```

Remember that you cannot configure a line until you have brought it up as described in the previous section, "Bringing Up Lines."

Step 3 To display the configuration for a T1 line, enter the **dspln -ds1** <*bay.line*> command. Replace *bay* with the bay number 2, since the PXM1E interface back card is always in the lower bay. Replace *line* with number of the interface you want to configure. The following example shows the configuration displayed for a T1 line:

```
pxm1e58.1.PXM.a > dspln -ds1 2.1
  Line Number         : 2.1
  Admin Status        : Down              Alarm Status        : Clear
  Line Type           : dsx1ESF           Number of ports     : 0
  Line Coding         : dsx1B8ZS          Number of partitions: 0
  Line Length(meters) : 40                Number of SPVC      : 0
  Loopback            : NoLoop            Number of SPVP      : 0
  Xmt. Clock source   : localTiming       Number of SVC       : 0
  Valid Intervals     : 0
```

For more information, see the "Verifying Line Configuration" section later in this chapter.

Step 4 To configure a T1 (DS1) line, enter the following commands:

```
mgx8830b.2.PXM.a > cnfln -ds1 <bay.line> -len <LineLength> -clk <clockSource>
```

Table 3-2 describes the all parameters for configuring lines. Be sure to use only the parameters listed for T1 lines.

Step 5 To verify your configuration changes, enter the **dspln** command.

Configuring E1 Lines

At the physical level, you can configure the line clock source for E1 lines. The following procedure describes how to configure E1 lines.

Step 1 Establish a configuration session using a user name with GROUP1 privileges or higher.

Step 2 If you do not know the line number you want to configure, enter the **dsplns** command to display a list of the lines:

```
mgx8830b.2.PXM.a > dsplns
```

Remember that you cannot configure a line until you have brought it up as described in the section, “Bringing Up Lines.”

Step 3 To display the configuration for a line, enter the **dspln -e1** <*bay.line*> command. Replace *bay* with the number 2 to indicate the PXM1E interface back card in the lower bay. Replace *line* with number of the interface you want to configure. The following example shows the configuration displayed for an E1 line:

```
pxm1e58.1.PXM.a > dspln -e1 2.1
  Line Number         : 2.1
  Admin Status        : Down              Alarm Status        : Clear
  Line Type           : dsx1ESF           Number of ports     : 0
  Line Coding         : dsx1B8ZS          Number of partitions: 0
  Loopback            : NoLoop            Number of SPVC      : 0
  Xmt. Clock source   : localTiming       Number of SPVP      : 0
  Valid Intervals     : 0                 Number of SVC       : 0
```

For more information, see the “Verifying Line Configuration” section later in this chapter.

Step 4 To configure an E1 line, enter the following commands:

```
mgx8830b.2.PXM.a > cnfln -e1 <bay.line> -clk <clockSource>
```

Table 3-2 describes the all the parameters for configuring lines. Be sure to use only the parameters listed for E1 lines.

Step 5 To verify your configuration changes, enter the **dspln** command.

Configuring SONET Lines

At the physical level, you can configure the line clock source for SONET lines. The following procedure describes how to configure SONET lines.

Step 1 Establish a configuration session using a user name with GROUP1 privileges or higher.

Step 2 If you do not know the line number you want to configure, enter the **dsplns** command to display a list of the lines:

```
mgx8830b.2.PXM.a > dsplns
```

Remember that you cannot configure a line until you have brought it up as described in the previous section, "Bringing Up Lines."

Step 3 To display the configuration for a line, enter the **dspln** command. For example:

```
mgx8830b.2.PXM.a > dspln -sonet 2.1
  Line Number            : 2.1
  Admin Status           : Up                Alarm Status        : Clear
  Loopback               : NoLoop            APS enabled         : Enable
  Frame Scrambling       : Enable            Number of ports     : 1
  Xmt Clock source       : localTiming       Number of partitions: 1
  Line Type              : sonetSts3c        Number of SPVC      : 0
  Medium Type(SONET/SDH) : SONET             Number of SPVP      : 0
  Medium Time Elapsed    : 623               Number of SVC       : 0
  Medium Valid Intervals : 72
  Medium Line Type       : ShortSMF
```

For more information, see the "Verifying Line Configuration" section later in this chapter.

Step 4 To configure a SONET line, enter the following commands:

```
mgx8830b.2.PXM.a > cnfln -sonet <bay.line> -slt <LineType> -clk <clockSource>
```

Table 3-2 describes the parameters for configuring lines. Be sure to use only the parameters listed for SONET lines.

Step 5 To verify your configuration changes, enter the **dspln** command.

Configuring T3 Lines

At the physical communications level, you can configure the following options for DS3 lines:

- Line type
- Line length (distance in meters)
- C-bit checking
- Line clock source
- Out of frame alarm criteria
- RcvFEACValidation

The following procedure describes how to configure T3 lines.

Step 1 Establish a configuration session using a user name with GROUP1 privileges or higher.

Step 2 If you do not know the line number you want to configure, enter the **dsplns** command to display a list of the lines.

```
mgx8830b.2.PXM.a > dsplns
```

Remember that you cannot configure a line until you have brought it up with the **upln** command, as described in the "Bringing Up Lines" section earlier in this chapter.

Step 3 To display the configuration for a line, enter the **dspln** command. For example:

```
mgx8830b.2.PXM.a > dspln -ds3 1.1
  Line Number         : 1.1
  Admin Status        : Up                Alarm Status        : Clear
  Line Type           : ds3cbitadm        Number of ports     : 1
  Line Coding         : ds3B3ZS           Number of partitions: 0
  Line Length(meters) : 0                 Number of SPVC      : 0
  OOFCriteria         : 3Of8Bits          Number of SPVP      : 0
  AIS c-Bits Check    : Check             Number of SVC       : 0
  Loopback            : NoLoop
  Xmt. Clock source   : localTiming
  Rcv FEAC Validation : 4 out of 5 FEAC codes
```

For more information, see the "Verifying Line Configuration" section later in this chapter.

Step 4 To configure a T3 line, enter the following command:

```
mgx8830b.2.PXM.a > cnfln -ds3 <bay.line> -len <LineLength> -clk <clockSource>
-lt <LineType> -oof <OOFCriteria> -cb <AIScBitsCheck> -rfeac <RcvFEACValidation>
```

Table 3-2 lists the parameter descriptions for configuring lines. Be sure to use only the parameters listed for T3 lines.

Step 5 To verify your configuration changes, enter the **dspln** command.

Configuring E3 Lines

At the physical communications level, you can configure the Transmit clock source for E3 lines. The following procedure describes how to configure E3 lines.

Step 1 Establish a configuration session using a user name with GROUP1 privileges or higher.

Step 2 If you do not know the line number you want to configure, enter the **dsplns** command to display a list of the lines.

Step 3 To display the configuration for a line, enter the **dspln** command.

```
mgx8830b.2.PXM.a > dspln -e3 1.1
```

Remember that you cannot configure a line until you have brought it up with the **upln** command, as described in the "Bringing Up Lines" section earlier in this chapter.

Step 4 To configure an E3 line, enter the following command:

```
8mgx8830b.2.PXM.a > cnfln -e3 <bay.line> -clk <clockSource>
```

Table 3-2 lists the parameter descriptions for configuring SONET, DS3 and E3 lines. Be sure to use only the parameters listed for E3 lines.

Step 5 To verify your configuration changes, enter the **dspln** command.

Verifying Line Configuration

To display the configuration of a line, use the following procedure.

Step 1 Establish a CLI management session at any user access level.

Step 2 If you do not know the line number you want to view, display a list of the lines by entering the following command:

```
mgx8830b.2.PXM.a > dsplns
```

Step 3 To display the configuration of a single line, enter the following command:

```
mgx8830b.2.PXM.a > dspln -type <bay.line>
```

Table 3-3 describes the **dspln** command parameters. The line configuration appears as follows:

```
mgx8830b.2.PXM.a > dspln -sonet 2.1
  Line Number            : 2.1
  Admin Status           : Up                  Alarm Status         : Clear
  Loopback               : NoLoop              APS enabled          : Enable
  Frame Scrambling       : Enable              Number of ports      : 1
  Xmt Clock source       : localTiming         Number of partitions: 1
  Line Type              : sonetSts3c          Number of SPVC       : 0
  Medium Type(SONET/SDH) : SONET               Number of SPVP       : 0
  Medium Time Elapsed    : 80                  Number of SVC        : 0
  Medium Valid Intervals : 73
  Medium Line Type       : ShortSMF
```

Table 3-3 dspln Command Parameters

Parameter	Description
type	The parameter specifies the type of line that is connected to the switch. Replace <*type*> with **-ds1**, **-e1**, **-ds3, -e3,** or **-sonet**. Use the **dsplns** command to view the configured line type in the *Line Type* column.
bay	Replace <*bay*> with **2** to indicate that the line is connected to a PXM1E back card in the lower bay.
line	Replace <*line*> with the number that corresponds to the line for which you want to display information.

Configuring Inverse Multiplexing for ATM

The Inverse Multiplexing for ATM (IMA) feature enables multiple T1 or E1 lines to be grouped into a single high-speed ATM port. The advantage of the IMA feature is that you do not need T3/E3 circuits to support high bandwidth on your switch. On Cisco MGX 8850 (PXM1E) and Cisco MGX 8830 switches,

IMA is supported on the PXM1E-16-T1E1 and AUSM-8-T1E1/B cards. On Cisco MGX 8850 (PXM45) switches, IMA is supported on AXSM-32-T1-E and AXSM-32-E1-E cards. IMA is not supported on Cisco MGX 8950 switches.

Note The procedures in this chapter apply only to the PXM1E card. To configure IMA on AUSM/B cards, refer to the *Cisco ATM Services (AUSM/MPSM) Configuration Guide and Command Reference for MGX Switches, Release 5*. To configure IMA on AXSM-32-T1E1-E cards, refer to the *Cisco ATM Services (AXSM) Configuration Guide and Command Reference for MGX Switches, Release 5*.

The PXM1E-16-T1E1 card supports IMA version 1.0 and version 1.1. A single IMA group can support up to 16 T1 or E1 links. Each T1 IMA link supports up to 1.5 Mbps, for a total of 24 Mbps per back card. Each E1 IMA link supports up to 2 Mbps, for a total of 32 Mbps per back card. If IMA is disabled on the PXM1E-16-T1E1, each T1 or E1 interface can be configured as a single port running at full line rate.

Each combination of multiple links is called an IMA group. IMA groups are comprised of IMA links.

Note During PXM1E-16-T1E1 switchovers, traffic loss on an IMA group can be around 3 seconds, and connections on the IMA group may be re-routed.

Configuring IMA ports on PXM1E cards is a three-step process.

1. Create and configure an IMA group
2. Add IMA links to the IMA group
3. Add and configure an IMA port for the IMA group

The sections that follow provide detailed procedures for configuring IMA on PXM1E-16-T1E1 ports.

Creating an IMA Group

Note Both ends of an IMA connection must support IMA, and the IMA configuration must match on both ends.

To create an IMA group, use the following procedure:

Step 1 Establish a configuration session with the active PXM1E.

Step 2 Enter the **dsplns** command to display all configured lines on the current card.

```
MGXswitch.7.PXM.a >  dsplns
Line Line      Line      Line     Length     Valid     Alarm
Num  State     Type      Lpbk    (meters)    Intvls    State
---- ----- --------- ----------- --------  ---------- -------
 2.1    Up   dsx1ESF      NoLoop       40          89 Critical
 2.2  Down   dsx1ESF      NoLoop       40           0 Clear
 2.3  Down   dsx1ESF      NoLoop       40           0 Clear
 2.4  Down   dsx1ESF      NoLoop       40           0 Clear
 2.5  Down   dsx1ESF      NoLoop       40           0 Clear
 2.6  Down   dsx1ESF      NoLoop       40           0 Clear
 2.7  Down   dsx1ESF      NoLoop       40           0 Clear
 2.8  Down   dsx1ESF      NoLoop       40           0 Clear
 2.9  Down   dsx1ESF      NoLoop       40           0 Clear
2.10  Down   dsx1ESF      NoLoop       40           0 Clear
2.11  Down   dsx1ESF      NoLoop       40           0 Clear
2.12  Down   dsx1ESF      NoLoop       40           0 Clear
2.13  Down   dsx1ESF      NoLoop       40           0 Clear
2.14  Down   dsx1ESF      NoLoop       40           0 Clear
2.15  Down   dsx1ESF      NoLoop       40           0 Clear
2.16  Down   dsx1ESF      NoLoop       40           0 Clear
```

Note If a line you want to add to the IMA group is up, enter the **dnln** <*x.line*> command to bring that line down. A line must be down before you add it to an IMA group.

Step 3 Enter the **addimagrp** command to create the IMA group, as shown in the following example:

```
MGXswitch.7.PXM.a > addimagrp <group> <version> <minLinks> <txImaId> <txFrameLen>
<txclkMode> <diffDelayMax>
```

Table 3-4 describes the parameters for the **addimagrp** command.

Table 3-4 addimagrp Command Parameters

group	Enter an IMA group number using the format *bay.line*. On a PXM1E, the bay number is always 2 and the range for lines is 1-16.
version	IMA version. Enter one of the following values: • Version 1.0 = 1 • Version 1.1 = 2
minLinks	Minimum number of links required for group operation. For example, if you create an IMA group of 4 lines and specify a minimum number of 3 lines, then three of the four specified lines must be operational before the IMA group can be used. The range for this value is from 1 to n, where n represents the number of lines that are dedicated to the group.
txImaId	Transmit IMA ID, which is the IMA ID number transmitted in the IMA ID field (Range: 0-255). The transmit IMA ID should be different at each end of the IMA link. When the transmit ID is different at each end, the switch accurately detects link loopbacks. If the same transmit ID is configured at both ends of an IMA link, the switch will incorrectly determine that the link is in loopback state.

Table 3-4 addimagrp Command Parameters (continued)

txFrameLen	Transmit frame length. The optional values for each IMA version are: • Version 1.0 = 128 • Version 1.1 = 32, 64, 128, 256
txclkMode	Transmit clock mode. The available modes and option numbers are: • Common Transmit Clock (CTC) = 1 • Independent Transmit Clock (ITC) = 2 **Note** Option 2: ITC is not supported in Release 5 of the Cisco MGX 8850 (PXM1E) and Cisco MGX 8830 switches.
diffDelayMax	Maximum receive link differential delay. The ranges for each link type are: • T1 = 1 to 275 msec • E1 = 1 to 220 msec

In the following example, the user creates IMA group 2.1 running IMA version 1.0. The minimum number of lines required for this group to operate is 3. The transmit IMA ID is 255, the transmit frame length is 128, the transmit clock mode is CTC, and the maximum differential delay is 100.

```
MGXswitch.7.PXM.a > addimagrp 2.1 1 3 255 128 1 100
```

Step 4 To verify that the IMA group has been created, enter the **dspimagrps** command:

```
MGXswitch.7.PXM.a > dspimagrps

Ima  Min  Tx   Rx   Tx   Diff                NE-IMA                FE-IMA  IMA
Grp  Lnks Frm  Frm  Clk  Delay                state                 state  Ver
          Len  Len  Mode (ms)
--------------------------------------------------------------------------------
 2.1   1  128  128  CTC  100                 StartUp              StartUp  1.0
 2.2   3  128  128  CTC  100                 StartUp              StartUp  1.1
 2.3   3  128  128  CTC  100                 StartUp              StartUp  1.1
```

Configuring an IMA Group

Once you have added an IMA group on your PXM1E, you can configure that IMA group's parameters. Use the following procedure to configure IMA group parameters.

Step 1 Establish a configuration session with the active PXM1E.

Step 2 Enter the **dspimagrps** command to list the IMA groups configured on the current card.

```
M8830_CH.1.PXM.a > dspimagrps
Ima  Min  Tx   Rx   Tx   Diff                    NE-IMA                 FE-IMA  IMA
Grp  Lnks Frm  Frm  Clk  Delay                    State                  State  Ver
          Len  Len  Mode (ms)
--------------------------------------------------------------------------------
 2.1   1  128  128  CTC  275             Operational           Operational  1.0
```

Step 3 To display the configuration information for the particular IMA group that you want to configure, enter the **dspimagrp** <*group*> command. The IMA group numbers are listed in the Ima Grp column. In the following example, the user displays the IMA group 2.1.

```
M8830_CH.1.PXM.a > dspimagrp 2.1
    Group Number                    : 2.1
    NE IMA Version                  : 1.0
    Group Symmetry                  : Symm  Operation
    Tx Min Num Links                : 1
    Rx Min Num Links                : 1
    NE Tx Clk Mode                  : CTC
    FE Tx Clk Mode                  : CTC
    Tx Frame Len (bytes)            : 128
    Rx Frame Len (bytes)            : 128
    Group GTSM                      : Up
    NE Group State                  : Operational
    FE Group State                  : Operational
    Group Failure Status            : No Failure
    Tx IMA ID                       : 255
    Rx IMA ID                       : 255
    Max Cell Rate (c/s)             : 14367
    Avail Cell Rate (c/s)           : 14367
    Diff Delay Max  (msecs)         : 275
    Diff Delay Max Observed (msecs) : 0
    Accumulated Delay (msecs)       : 0
    Clear Accumulated Delay Status  : Not In Progress
    GTSM Up Integ Time (msecs)      : 0

Type <CR> to continue, Q<CR> to stop:
    GTSM Dn Integ Time (msecs)      : 4000
    Num Tx Cfg Links                : 4
    Num Rx Cfg Links                : 4
    Num Act Tx Links                : 4
    Num Act Rx Links                : 4
    Least Delay Link                : 2.4
    Tx Timing Ref Link              : 2.4
    Rx Timing Ref Link              : 2.1
    Group Running Secs              : 3999077
    Alpha Val                       : 2
    Beta Val                        : 2
    Gamma Val                       : 1
    Tx OAM Label                    : 1
    Rx OAM Label                    : 1
    Test Pattern Procedure Status   : Disabled
    Test Link                       : Unknown
    Test Pattern                    : 255
    Stuff Cell Indication (frames)  : 1
    Version Fallback Enabled        : true
    Auto-Restart Mode               : disable
    Rx IMA ID Expected              : -1
    Auto-Restart Sync State         : disable
```

Step 4 To configure an IMA group, enter the **cnfimagrp** command, as shown in the following example:

```
M8830_CH.1.PXM.a > cnfimagrp <-grp <group> [-ver <version>] [-txm <minLinks>] [-txid
<txImaId>] [-txfl <txFrameLen>] [-dd <diffDelayMax>] [-uptim<groupUpTime>] [-dntim
<groupDownTime>] [-vfb <verFallback>] [-mode <autoRestart>] [-rxid <rxImaIdExpected>]
```

Table 3-5 describes the parameters for the **cnfimagrp** command.

Table 3-5 cnfimagrp Command Parameters

-grp <*group*>	Enter the group number for the IMA group you are configuring. To display the available IMA groups, enter the **dspimagrps** command.
-ver <*version*>	The protocol version of the IMA group. • IMA version 1.0 = 1 • IMA version 1.1 = 2
-txm <*minLinks*>	The minimum number of links that will allow the IMA group to be operational (Range: 1-16).
-txid <*txImaId*>	The IMA ID number transmitted in the IMA ID field (Range: 0-255). The transmit IMA ID should be different at each end of the IMA link. When the transmit ID is different at each end, the switch accurately detects link loopbacks. If the same transmit ID is configured at both ends of an IMA link, the switch will incorrectly determine that the link is in loopback state. **Note** This field cannot be changed while the IMA group is up.
txFrameLen	The length of transmitted IMA frame in cells. This frame length is described as M consecutive cells for each Tx frame. The txFrameLen value is configurable ONLY for IMA version 1.1. For IMA version 1.0, the txImaFrameLength value is always 128. For IMA version 1.1, the txImaFrameLength value can be 32, 64, 128, or 256 bytes.
diffDelayMax	The maximum differential delay in milliseconds. Enter a number in the range for the appropriate link type: • T1 range = 1 through 275 msec • E1 range = 1 through 220 msec Defaults: T1 = 275, E1 = 220
groupUpTime	0-400000 milliseconds
groupDownTime	0 and 100000 milliseconds
-vfb <*verFallback*>	Version fallback enable. The available options are: • True = 1 • False = 2

Table 3-5 cnfimagrp Command Parameters (continued)

-mode <*autoRestart*>	The -mode parameter is optional and configures the IMA autorestart feature. The parameter options and the numbers that select them are: • Disable autorestart for this IMA group = 1 • Enable autorestart for this group and relearn the receive IMA ID during autorestart = 2 • Enable autorestart for this group and use the previously learned receive IMA ID during autorestart = 3 **Note** Before configuring the -mode option, you must enable IMA autorestart for the card using the **cnfimaparms** command. For more information on using this feature, see "Restarting an IMA Group" in Chapter 9, "Switch Operating Procedures."
-rxid <*rxImaIdExpected*>	This optional parameter defines the receive IMA ID expected. This number should match the transmit IMA ID (txid) configured at the far end of the IMA link. A configured value of -1 (minus one) specifies that the IMA group should learn the far end ID on restart. The range is -1 to 255. For more information on using this feature, see "Restarting an IMA Group" in Chapter 9, "Switch Operating Procedures."

Note Modifying any of the attributes causes the IMA group to restart.

In the following example, the user modifies the transmit frame length, the IMA group uptime, and the IMA group downtime:

```
M8830_CH.1.PXM.a > cnfimagrp -grp 2.1 -txfl 128 -uptim 100 -dntim 100
```

Step 5 To verify IMA group configuration changes, enter a **dspimagrp** command for the appropriate IMA group.

```
M8830_CH.1.PXM.a > dspimagrp 2.1
    Group Number                     : 2.1
    NE IMA Version                   : 1.0
    Group Symmetry                   : Symm  Operation
    Tx Min Num Links                 : 1
    Rx Min Num Links                 : 1
    NE Tx Clk Mode                   : CTC
    FE Tx Clk Mode                   : CTC
    Tx Frame Len (bytes)             : 128
    Rx Frame Len (bytes)             : 128
    Group GTSM                       : Up
    NE Group State                   : Operational
    FE Group State                   : Operational
    Group Failure Status             : No Failure
    Tx IMA ID                        : 255
    Rx IMA ID                        : 255
    Max Cell Rate (c/s)              : 14367
    Avail Cell Rate (c/s)            : 14367
    Diff Delay Max  (msecs)          : 275
    Diff Delay Max Observed (msecs)  : 0
    Accumulated Delay (msecs)        : 0
    Clear Accumulated Delay Status   : Not In Progress
    GTSM Up Integ Time (msecs)       : 0
```

```
Type <CR> to continue, Q<CR> to stop:
    GTSM Dn Integ Time (msecs)      : 4000
    Num Tx Cfg Links                : 4
    Num Rx Cfg Links                : 4
    Num Act Tx Links                : 4
    Num Act Rx Links                : 4
    Least Delay Link                : 2.3
    Tx Timing Ref Link              : 2.4
    Rx Timing Ref Link              : 2.1
    Group Running Secs              : 3999594
    Alpha Val                       : 2
    Beta Val                        : 2
    Gamma Val                       : 1
    Tx OAM Label                    : 1
    Rx OAM Label                    : 1
    Test Pattern Procedure Status   : Disabled
    Test Link                       : Unknown
    Test Pattern                    : 255
    Stuff Cell Indication (frames)  : 1
    Version Fallback Enabled        : true
    Auto-Restart Mode               : disable
    Rx IMA ID Expected              : -1
    Auto-Restart Sync State         : disable
```

Adding an IMA Link to an IMA Group

Once you have established and configured an IMA group, you can begin adding IMA links to the group. Use the following procedure to add an IMA link to an IMA group.

Step 1 Enter the **dspimagrps** command to see the available IMA groups, as shown in the following example:

```
MGXswitch.7.PXM.a > dspimagrps

Ima  Min  Tx   Rx   Tx   Diff                NE-IMA                  FE-IMA  IMA
Grp  Lnks Frm  Frm  Clk  Delay                state                   state  Ver
          Len  Len  Mode (ms)
--------------------------------------------------------------------------------
 2.1   1  128  128  CTC  100                 StartUp               StartUp  1.0
 2.2   3  128  128  CTC  100                 StartUp               StartUp  1.1
 2.3   3  128  128  CTC  100                 StartUp               StartUp  1.1
```

Step 2 Enter the **addimalnk** <*link*> <*group*> command to add an IMA link to an IMA group. Replace <*link*> with the number of a line you want to add to the group. Enter the line number in the format *bay.line*, where *bay* is always 2 on the PXM1E and the line number is the appropriate number as displayed in with the **dsplns** command.

Replace <*group*> with the number of the group. Group numbers are displayed in the Ima Grp column of the **dspimagrps** command display.

In the following example, the user adds line 1 to IMA group 2.1.

```
MGXswitch.7.PXM.a > addimalnk 2.1 2.1
```

Step 3 To verify that the link has been added, enter the **dspimalnks** command.

Configuring IMA Links

Once you have added an IMA link, you can configure that link. Use the following procedure to configure an IMA link.

Step 1 To display a list of IMA links that can be configured, enter the dspimalnks command as follows:

```
M8830_CH.1.PXM.a > dspimalnks
Link   Grp   Rel                NE                NE            NE Rx   Tx   Rx
Num    Num   Dly                Tx                Rx             Fail  LID  LID
             (ms)            State             State           Status
-----------------------------------------------------------------------------
 2.1   2.1     0           Active            Active      No Failure    0    0
 2.2   2.1     0           Active            Active      No Failure    1    1
 2.3   2.1     0           Active            Active      No Failure    2    2
 2.4   2.1     0           Active            Active      No Failure    3    3
```

Step 2 To view the current configuration of a link, enter the **dspimalnk** <*link*> command as follows:

```
M8830_CH.1.PXM.a > dspimalnk 2.1
  IMA Link Number                  : 2.1
  IMA Link Group Number            : 2.1
  Link Rel Delay (msecs)           : 0
  Link NE Tx State                 : Active
  Link NE Rx State                 : Active
  Link FE Tx State                 : Active
  Link FE Rx State                 : Active
  Link NE Rx Failure Status        : No Failure
  Link FE Rx Failure Status        : No Failure
  IMA Link Tx LID                  : 0
  IMA Link Rx LID                  : 0
  Link Rx Test Pattern             : 255
  Link Test Procedure Status       : Disabled
  Link LIF Integ UpTime            : 2500
  Link LIF Integ DownTime          : 10000
  Link LODS Integ UpTime           : 2500
  Link LODS Integ DownTime         : 10000
```

Step 3 To configure a link, enter the **cnfimalnk** command as follows:

cnfimalnk -lnk <*link*> [-uplif <*lifUpTime*>] [-dnlif <*lifDnTime*>] [-uplods <*lodsUpTime*>] [-dnlods <*lodsDnTime*>]

Table 3-6 describes the parameters for the **cnfimagrp** command.

Table 3-6 cnfimalnk Command Parameters

-lnk <*link*>	Enter the link number as it appears in the Link Num column of the **dspimalnks** command.
-uplif <*lifUpTime*>	Loss of IMA Frame (LIF) integration up time. The LIF defect is the occurrence of persistent OIF (Out of IMA Frame) anomalies for at least 2 IMA frames. Range: 0-25000 milliseconds.
-dnlif <*lifDnTime*>	LIF integration down time. Range 0-25000 milliseconds.

Table 3-6 cnfimalnk Command Parameters (continued)

-uplods <*lodsUpTime*>	Link Out of Delay Synchronization (LODS) integration up time. The LODS is a link event indicating that the link is not synchronized with the other links within the IMA group. Range 0-25000 milliseconds.
-dnlods <*lodsDnTime*>	LODS integration down time. Range 0-25000 milliseconds.

In the following example, the user configures link 2.5 so that it has an LIF up time of 25000 milliseconds, an LIF downtime of 1000 milliseconds, an LODS integration up time of 25000 milliseconds, and an LODS integration down time of 1000 milliseconds.

```
MGXswitch.7.PXM.a > cnfimalnk -lnk 2.5 -uplif 25000 -dnlif 1000 -uplods 25000 -dnlods 1000
```

Step 4 Enter the **dspimalnk** <*link*> command to verify the configuration of the new IMA link.

Adding an IMA Port

Once you have configured an IMA group, you need to add an IMA port to the group to enable ATM services on that IMA group. Use the following procedure to add an IMA port to an IMA group.

Step 1 Establish a configuration session using a user name with GROUP1 privileges or higher.

Step 2 Get the group number on which you will add the port. To display a list of the IMA group numbers, enter the **dspimagrps** command.

Step 3 Verify that the port number you want to use is not already configured. To display a list of the configured ports on the PXM1E card, enter the **dspports** command.

Port numbers appear in the ifNum (interface number) column. The interfaces listed include UNI and NNI ports. Choose a port number that is not already in use.

Step 4 To add an ATM port to an IMA group, enter the following command:

```
mgx8830a.1.PXM.a > addimaport <ifNum> <group> <guaranteedRate> <maxRate> <sctID> <ifType>
[vpi <vpi>] [-minvpi <minvpi>] [-maxvpi <maxvpi>]
```

Table 3-7 lists the parameter descriptions for adding IMA ports.

Note Refer to Figure 3-4 earlier in this chapter to see the relationship between logical interface numbers and physical lines.

Table 3-7 Parameters for addimaport Command

Parameter	Description
ifNum	Specify a port number for the new IMA port. The port number must be available (not already configured) and in the range of 1 to 31. To view the configured port numbers, use the **dspports** command.
group	Enter the group number of an existing IMA group. To display a list of IMA groups, enter the **dspimagrps** command.
guaranteed Rate	Use one of the following formulas to compute the guaranteed minimum rate: • For a T1-based IMA group, the rate is as follows: from 50 through N * (3622 * (M-1)/M * 2048/2049) • For an E1-based IMA group, the rate is as follows: from 50 through N * (4528 * (M-1)/M * 2048/2049) *N* is the number of IMA links in the IMA group, and *M* is the IMA group frame length. **Note** On the PXM1E, the guaranteed minimum bandwidth rate does not have to be the same as maxRate.
maxRate	Use one of the following formulas to compute the maximum rate: • For a T1-based IMA group the rate is as follows: from 50 through N * (3622 * (M-1)/M * 2048/2049) • For an E1-based IMA group, the rate is: from 50 through N * (4528 * (M-1)/M * 2048/2049) *N* is the number of IMA links in the IMA group, and *M* is the IMA group frame length. **Note** On the PXM1E, the maxRate does not have to be the same as guaranteed minimum bandwidth rate.
sctID	Enter a registered PXM1E port SCT number. For more information on selecting SCTs, refer to Table 7-1. See the *Cisco WAN Manager User's Guide, Release 15*, for information how to create a new SCT.
ifType	Enter a number that indicates the interface type as follows: **1**—UNI, one UNI port allowed per physical line **2**—NNI, one NNI port allowed per physical line **3**—VNNI, multiple virtual NNI ports supported over one VPI **4**—VUNI, multiple virtual UNI ports supported over one VPI **5**—EVUNI, multiple enhanced virtual UNI ports supported over a range of VPIs **6**—EVNNI, multiple enhanced virtual NNI ports supported over a range of VPIs

Table 3-7 Parameters for addimaport Command (continued)

Parameter	Description
vpi	Virtual path identifier for a virtual port of VUNI or VNNI type. The ranges are as follows: • VNNI Range: 1-4095 • VUNI Range: 1-255
minvpi	Minimum virtual path identifier for a virtual port of EVUNI or EVNNI type. The ranges are as follows: • EVUNI, Range: 0-255 • EVNNI, Range: 0-4095
maxvpi	Maximum virtual path identifier for a virtual port of EVUNI or EVNNI type. The ranges are as follows: • EVUNI, Range: 0-255 • EVNNI, Range: 0-4095

Step 5 To display a list of all conventional and IMA ports on a PXM1E card, enter the **dspports** command as shown in the following example:

```
M8830_CH.1.PXM.a > dspports
ifNum Line Admin Operational    Guaranteed Maximum    sctID     ifType  VPI   MINVPI  MAXVPI  IMA
           State State          Rate       Rate    Conf./InUse         (VNNI, (EVUNI, (EVUNI, GRP
                                                                        VUNI)  EVNNI)  EVNNI)
----- ---- ----- -------------- ---------- ------- ------------ ------ ------ ------- ------- ---
    1  N/A    Up             Up      14367   14367   6/  6         NNI      0       0       0 2.1
    5  2.5    Up LowerLayerDown       3622    3622   0/  0 =Def    NNI      0       0       0 N/A
```

The *IMA Grp* column identifies which ports are assigned to IMA groups. The *Line* column also shows N/A for IMA groups.

Step 6 To display information on an IMA port, enter the **dspport** <*ifnum*> command as follows:

```
M8830_CH.1.PXM.a > dspport 1
  Interface Number                : 1
  Line Number                     : N/A       IMA Group Number      : 2.1
  Admin State                     : Up        Operational State     : Up
  Guaranteed bandwidth(cells/sec): 14367     Number of partitions  : 1
  Maximum bandwidth(cells/sec)    : 14367     Number of SPVC        : 0
  ifType                          : NNI       Number of SPVP        : 0
  VPI number (VNNI, VUNI)         : 0         Number of SVC         : 4
  MIN VPI (EVNNI, EVUNI)          : 0         MAX VPI (EVNNI, EVUNI): 0
  SCT Id (Conf./InUse)            : 6/6
  F4 to F5 Conversion             : Disabled
```

The *IMA Group Number* row identifies this port as an IMA port.

Establishing Redundancy Between Two Lines with APS

Cisco MGX switches use Automatic Protection Switching (APS) to provide line fault tolerance. APS is a component of SONET and is therefore available only on optical interfaces and STM-1 interfaces (which are the electrical equivalent of SONET OC-3). The *Cisco MGX 8850 (PXM1E/PXM45), Cisco MGX 8950, Cisco MGX 8830, and Cisco MGX 8880 Hardware Installation Guide, Releases 2 Through 5*, lists all the card types and shows which cards support APS.

When you configure APS, you must define a *working line* and a *protection line* for each redundant line pair. The working line is the primary or preferred line, and communications take place over that line as long as the line remains operative. Even when the working line and protection lines are on different cards and a switchover occurs between the front cards, the working line remains active unless the working line itself fails.

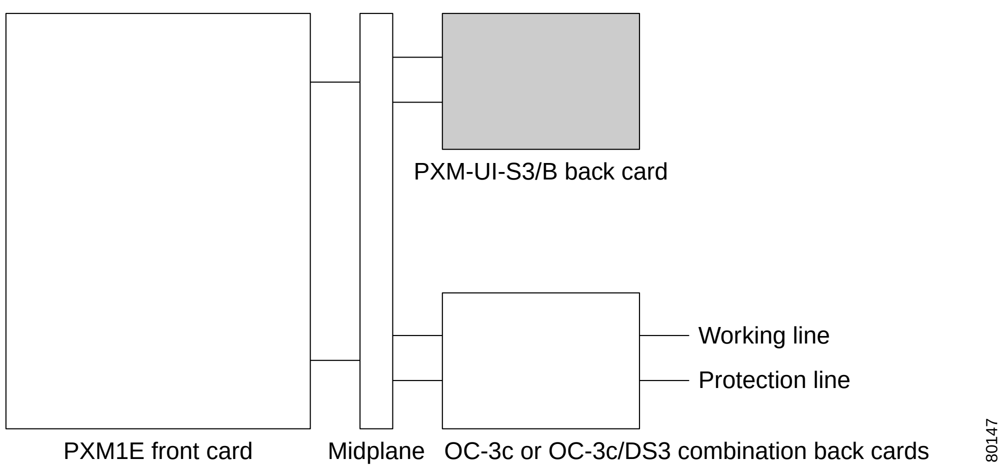
If a failure occurs on the working line, APS initiates a switchover to the protection line. The *revertive option* allows you to control what happens when a failed working line recovers. If the revertive option is enabled, the working line will become active after a configurable period of time. If the revertive option is disabled, you must manually switch over from the protective line to the working line after the working line recovers.

Cisco MGX switches support two types of APS: intracard APS and intercard APS. The following subsections describe these two APS options, provide guidelines for planning APS configurations, and describe how to configure APS.

Configuring Intracard APS Lines

Intracard APS configurations are created with the working and protection lines on the same back card or in the same back card set. As shown in Figure 3-2, intracard APS makes it possible to have redundant line protection for a standalone card configuration.

Figure 3-2 Standalone PXM1E with Intracard APS



When planning an intracard APS configuration on PXM1E cards, consider the following requirements:

- APS is not supported on T1, E1, T3, and E3 interfaces.
- The working line and the protection line must connect to adjacent ports on the same back card.
- For all cards except VXSM-4-155, the working line must be assigned to an odd-numbered port. For example, the working line could be line 1 and the protection line could be line 2.

- The working line must be assigned to a lower numbered port than the protection line. For example, the working line could be on port 3 and the protection line on port 4. If the protection line is on port 2, do not assign the working line to port 3.
- The switches at both ends of the APS lines must be configured for APS, and the role of each line (working or protection) must be the same at both ends of the line.

To establish redundancy between two lines on the same card, use the following procedure:

Step 1 Establish a configuration session using a user name with GROUP1_GP privileges or higher.

Step 2 If you have not done so already, bring up the working line as described in "Bringing Up Lines," which appears earlier in this chapter.

Step 3 Enter the **addapsln** command as follows:

```
mgx8830b.2.PXM.a > addapsln <workingIndex> <protectIndex> <archmode>
```

Replace <*workingIndex*> with the location of the working line using the format *slot.bay.line*. For example, to specify the line on card 2, bay 2, line 1, enter 1.2.1.

Note When specifying the slot number for the working line, always refer to the logical slot number, which is 1 for MGX 8830 switches and 7 for MGX 8850 switches. For example, in the previous paragraph, the working line is connected to slot 2, bay 2, line 1, but you must enter 1.2.1 to refer to this line.

Replace <*protectIndex*> with the location of the protection line, using the format *slot.bay.line*. For example, to specify the line on card 2, bay 2, line 2, enter 2.2.2.

Note When specifying the slot number for the protection line, always refer to the physical slot number. For example, in the previous paragraph, the working line is connected to slot 2, bay 2, line 2, so you must enter 2.2.2 to refer to this line.

Replace <*archmode*> with the option number that selects the APS architecture mode. Table 3-8 shows the option numbers and the architecture modes they select.

Table 3-8 APS Line Architecture Modes

Option	Description
1	Selects 1+1 Bellcore GR-253 APS protocol signaling (transmission on both working and protection lines).
2	Selects 1:1 Bellcore GR-253 APS protocol signaling (transmission on either the working line or the protection line) for intracard APS.
3	Selects 1+1 ITU-T G.783 AnnexB APS protocol signaling (transmission on both working and protection lines).
4	Selects 1+1 Y-cable signaling without K1 and K2. This option is not supported for intercard or intracard APS in this release.
5	Selects 1+1 straight cable signaling without K1 and K2.

The following example assigns 1+1 APS redundancy to two lines on the same card:

```
mgx8830b.2.PXM.a > addapsln 1.2.1 2.2.2 1
```

Step 4 To display a list of all APS lines on a PXM1E, enter the **dspapslns** command on the active PXM1E card.

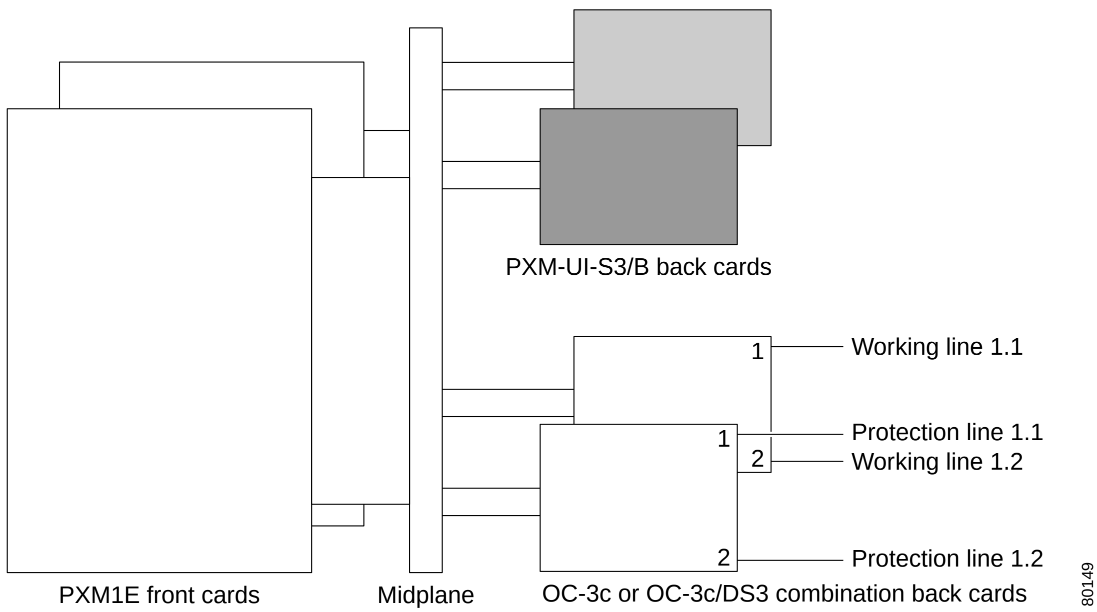
Step 5 To display information on a specific APS line, enter the **dspapsln** <*slot.bay.line*> command on the active PXM1E card.

For information on managing APS lines, see the "Managing Redundant APS Lines" section in Chapter 9, "Switch Operating Procedures."

Configuring Intercard APS Lines

Intercard APS configurations are created with the working and protection lines on different back cards. As shown in Figure 3-3, intercard APS makes it possible to extend the fault tolerance provided by redundant front cards to back cards and lines.

Figure 3-3 Redundant PXM1E Configuration with Intercard APS



Back card and line fault tolerance is provided by intercard APS. If the working line or the back card to which it is connected fails, communications traffic is rerouted through the protection line and the back card to which it is connected.

When planning a redundant line configuration that uses intercard APS on PXM1E, consider the following requirements:

- APS is not supported on T1, E1, T3, and E3 interfaces.
- Redundant PXM1E cards must be installed in the switch.
- Some PXM1E back card types require an APS mini-backplane to support intercard APS. The PXM1E APS mini-backplane requirements are describe in the *Cisco MGX 8850 (PXM1E/PXM45), Cisco MGX 8950, Cisco MGX 8830, and Cisco MGX 8880 Hardware Installation Guide, Releases 2 Through 5*.

- The working line must be defined on the primary card, and the protection line must be defined on the secondary card. The primary and secondary cards are predefined for PXM1E. In an MGX 8830 switch, slot 1 hosts the primary card and slot 2 hosts the secondary card. In an MGX 8850 (PXM1E) switch, slot 7 hosts the primary card and slot 8 hosts the secondary card.
- The working line and protection line numbers must be identical for intercard APS configurations. For example, you can assign the working line to line 9 on a primary PXM1E-COMBO card and the protection line to line 9 on a secondary card. You cannot assign the working line to line 9 on one card and the protection line to line 10 on the other.
- The switches at both ends of the APS lines must be configured for APS, and the role of each line (working or protection) must be the same at both ends of the line.

To establish redundancy between two lines on different cards, use the following procedure.

Note For intercard APS to operate properly, an APS connector may need to be installed between the two cards. For more information on APS connector requirements and how to install them, refer to the *Cisco MGX 8850 (PXM1E/PXM45), Cisco MGX 8950, Cisco MGX 8830, and Cisco MGX 8880 Hardware Installation Guide, Releases 2 Through 5*.

Step 1 Establish a configuration session using a user name with GROUP1_GP privileges or higher.

Step 2 If you have not done so already, bring up the working line as described in the "Bringing Up Lines" section.

Step 3 Ensure that the cards you are working on are functioning as a redundant pair.

Step 4 If an APS connector is required for your configuration, enter the **dspapsbkplane** command on both the standby and active cards to verify that the APS connector is installed properly.

Note This command can show different values for each of the two cards, which indicates the APS connector is seated properly on one card, but not on the other.

Step 5 Enter the **addapsln** command as follows:

```
mgx8830b.2.PXM.a > addapsln <workingIndex> <protectIndex> <archmode>
```

Replace <*workingIndex*> with the location of the working line using the format *slot.bay.line*. For example, to specify line 1 on the card in slot 2 of the lower bay, enter 2.2.1.

Replace <*protectIndex*> with the location of the protection line, using the same format used for the working line.

Note For intercard redundancy, the working index and protection index must specify the same line numbers on different cards. Also, the working line index must identify a line on the primary card.

Replace <*archmode*> with an option number that defines the type of line redundancy you want to use. Table 3-8 shows the option numbers and the types of redundancy they select.

The following example assigns 1+1 APS redundancy to lines on different cards:

```
mgx8830b.2.PXM.a > addapsln 1.2.2 2.2.2 1
```

Step 6 To display a list of all the APS lines on an PXM1E card, enter the **dspapslns** command.

Step 7 To display information on a specific APS line, enter the **dspapsln** <*slot.bay.line*> command on the active PXM1E card.

For information on managing APS lines, see the "Managing Redundant APS Lines" section in Chapter 9, "Switch Operating Procedures."

Adding ATM Ports

The previous chapter described how to bring up physical lines by specifying the correct line port number. The line ports correspond to line connectors on the switch back cards. Bringing up a line establishes minimal connectivity between two nodes. When you add an ATM port to a line, you enable ATM communications over the line.

Each line can support UNI or NNI ports. UNI ports are used for lines that connect to PBXs, ATM routers, and other ATM devices that connect to the core ATM network through the switch. NNI ports are used for trunks that connect to other core ATM network devices, such as another Cisco MGX 8850 (PXM1E/PXM45) switch.

You must configure one ATM port for each line or trunk to enable ATM communications over that link. You define the port type when you add the ATM port to the line or trunk. The port type can be one of the following:

- UNI
- NNI
- VUNI
- VNNI
- EVUNI
- EVNNI

To add an ATM port to a line, use the following procedure.

Step 1 Establish a configuration session using a user name with GROUP1 privileges or higher.

Step 2 Get the line number on which you will add the port. To display a list of the lines and line numbers, enter the following command:

```
mgx8830a.1.PXM.a > dsplns
```

Tip Remember that you cannot configure a line until you have brought it up as described in "Bringing Up Lines," which appears earlier in this chapter.

Step 3 Verify that the line and port number you want to use is not configured. To display a list of the ports configured on the PXM1E card, enter the following command:

```
mgx8830a.1.PXM.a > dspports
```

This command displays all ports on the PXM1E card in the ifNum (interface number) column. The interfaces listed include UNI, NNI, VUNI, VNNI, EVUNI, and EVNNI ports. Pay attention to the port numbers already in use. When you add a port, you must specify a port number that is unique on the PXM1E card. For example, if port number 2 is assigned to line 2.1 (bay 2, line 1), you cannot use port 2 on any other line on that PXM1E card.

Step 4 To add an ATM port to a line, enter the following command:

```
mgx8830a.1.PXM.a > addport <ifNum> <bay.line> <guaranteedRate> <maxRate> <sctID> <ifType>
[vpi <vpi>] [-minvpi <minvpi>] [-maxvpi <maxvpi>]
```

Table 3-9 lists the parameter descriptions for adding ports. Figure 3-4 shows the relationship between logical interface numbers and physical lines.

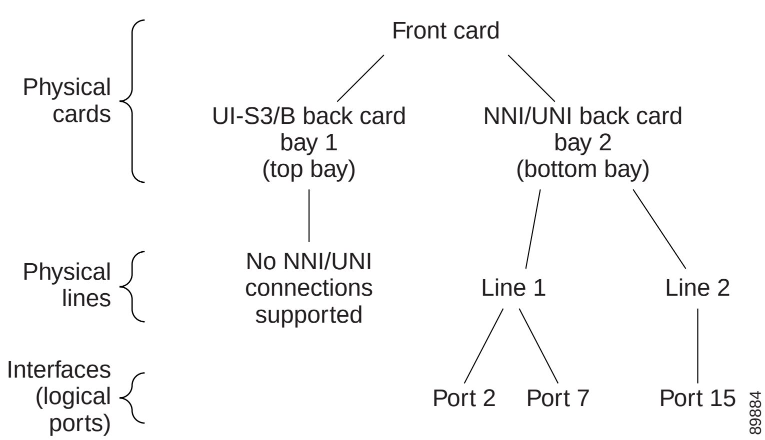
Table 3-9 Parameters for addport and cnfport Commands

Parameter	Description
ifNum	An ATM port is also called an interface. An ATM port is defined by its slot, bay, line, and interface numbers. You do not have to enter a slot number during port configuration because you identify the slot number when you select the card. Enter a number from 1 to 31 to identify this interface. For UNI and NNI ports, you can assign one logical interface per line.
bay	Replace <*bay*> with **2** to indicate the lower bay.
line	Replace <*line*> with the number that corresponds to the back card port to which the line is connected.
guaranteed Rate	Enter the minimum rate for the port in cells per second (cps). **Note** The <*guaranteedRate*> value should equal the <*maxRate*> value. The rate ranges for PXM1E are as follows: OC3: 50 – 353207. T3: 50 – 96000 (PLCP) or 104268 (ADM). E3: 50 – 80000. T1: 50-3622 cps E1: 50-4528 cps
maxRate	Enter the maximum rate for the port in cps. **Note** The <*maxRate*> value should equal the <*guaranteedRate*> value. The rate ranges are as follows: OC3: 50 – 353207. T3: 50 – 96000 (PLCP) or 104268 (ADM). E3: 50 – 80000. T1: 50-3622 cps E1: 50-4528 cps
sctID	Enter a registered PXM1E port SCT number. To display a list of all the registered SCTs, enter the **dspscts** command. For guidelines on selecting an SCT, refer to the "Cisco SCTs" section in Chapter 7, "Managing Service Class Templates."

Table 3-9 Parameters for addport and cnfport Commands (continued)

Parameter	Description
ifType	Enter a number that indicates the interface type as follows: **1**—UNI, one UNI port allowed per physical line **2**—NNI, one NNI port allowed per physical line **3**—VNNI, multiple virtual NNI ports supported over one VPI **4**—VUNI, multiple virtual UNI ports supported over one VPI **5**—EVUNI, multiple enhanced virtual UNI ports supported over a range of VPIs **6**—EVNNI, multiple enhanced virtual NNI ports supported over a range of VPIs
vpi	Virtual path identifier for a virtual port of VUNI or VNNI type. The ranges are as follows: • VNNI Range: 1-4095 • VUNI Range: 1-255
minvpi	Minimum virtual path identifier for a virtual port of EVUNI or EVNNI type. The ranges are as follows: • EVUNI, Range: 0-255 • EVNNI, Range: 0-4095
maxvpi	Maximum virtual path identifier for a virtual port of EVUNI or EVNNI type. The ranges are as follows: • EVUNI, Range: 0-255 • EVNNI, Range: 0-4095

Figure 3-4 Relationship Between Cards, Bays, Lines, and Logical Interface Numbers



The following example command defines a line port as a UNI line:

```
mgx8830a.1.PXM.a > addport 1 2.1 96000 96000 1 1
```

The following example command defines a line port as an NNI trunk:

```
mgx8830a.1.PXM.a > addport 2 2.1 3622 3622 52 2
```

Step 5 To display a list of the ports configured on the PXM1E card, enter the following command:

```
mgx8830a.1.PXM.a > dspports
```

This command displays all configured ports on the PXM1E card. Port numbers are listed in the ifNum (interface number) column. If you want to view information on a particular port, note the number of that port.

Step 6 To display the port configuration, enter the following command:

```
mgx8830a.1.PXM.a > dspport <ifNum>
```

Replace <*ifNum*> with the number assigned to the port during configuration. The following example shows the report for this command:

```
mgx8830a.1.PXM.a > dspport 1
  Interface Number               : 1
  Line Number                    : 2.3       IMA Grp Number      : N/A
  Admin State                    : Up        Operational State     : Up
  Guaranteed bandwidth(cells/sec): 353207    Number of partitions  : 1
  Maximum bandwidth(cells/sec)   : 353207    Number of SPVC        : 0
  ifType                         : NNI       Number of SPVP        : 0
  VPI number (VNNI, VUNI)        : 0         Number of SVC         : 3
  MIN VPI (EVNNI, EVUNI)         : 0         MAX VPI (EVNNI, EVUNI): 0
  SCT Id (Conf./InUse)           : 0/0=Def
  F4 to F5 Conversion            : Disabled
```

Tip To change the port configuration, enter the **cnfport** command, or enter the **delport** command to delete a port configuration. You can also activate and deactivate ports entering the **upport** and **dnport** commands. For more information on these commands, refer to the *Cisco MGX 8850 (PXM45/PXM1E), Cisco MGX 8950, Cisco MGX 8830, and Cisco MGX 8880 Command Reference, Release 5*.

Modifying ATM Ports

After you add a port, you can modify the following parameters with the **cnfport** command:

- Minimum cell rate
- Maximum cell rate
- Port SCT ID
- Minimum VPI for EVUNI and EVNNI
- Maximum VPI for EVUNI and EVNNI

To modify an ATM port, use the following procedure.

Step 1 Establish a configuration session using a user name with GROUP1 privileges or higher.

Step 2 Get the port number that you want to modify. To display a list of the ports configured on the PXM1E card, enter the following command:

```
mgx8830a.1.PXM.a > dspports
```

Step 3 To prepare for the configuration change, enter the **dnport** command to bring down the port as shown in the following example:

```
M8830_CH.2.PXM.a > dnport 1
Traffic loss will result on all connections on this port.
Do you want to proceed (Yes/No) ? y
```

Step 4 To change an ATM port configuration, enter the following command:

```
mgx8830a.1.PXM.a > cnfport <ifNum> <-min guaranteedRate> <-max maxRate> <-sct sctID>
<ifType> [vpi <vpi>] [-minvpi <minvpi>] [-maxvpi <maxvpi>]
```

Table 3-9 lists the parameter descriptions for adding and modifying ports. The following example changes the SCT for the port to SCT 6:

```
M8830_CH.2.PXM.a > cnfport 1 -sct 6
```

Step 5 To return the port to service, enter the **upport** command as shown in the following example:

```
M8830_CH.2.PXM.a > upport 1
```

Step 6 To verify port configuration changes, use the **dspports** and **dspport** commands.

Partitioning Port Resources Between Controllers

After you add a line or trunk port, you need to define how the port resources are used by the PNNI controller. You can assign the following resources to controllers:

- Range of VPI values
- Range of VCI values
- Guaranteed percent of bandwidth for ingress and egress directions
- Minimum and maximum number of connections

Note You can and should use the partition definition to control how available connections are distributed within the switch. Each switch, card, and port supports a maximum number of connections. Although you can enable the maximum number of connections on all ports, two or three very busy ports could use all available connections and disable communications on all other ports.

The port resources are defined as a group in a controller partition, which is dedicated to a single port controller. You must define one controller partition for each controller type you want to support, and you must configure one resource partition for each port that uses a controller.

Figure 3-5 presents a simplified view of the relationship between the port controller, controller partition, and resource partitions on MGX switches with PXM1E controllers. Because a PXM1E controller supports ATM connections on Cisco MGX 8850 (PXM1E) and Cisco MGX 8830 switches, you can configure resource partitions directly on the PXM1E card.

Figure 3-5 Relationship of Port Controller, Controller Partition, and Resource Partitions

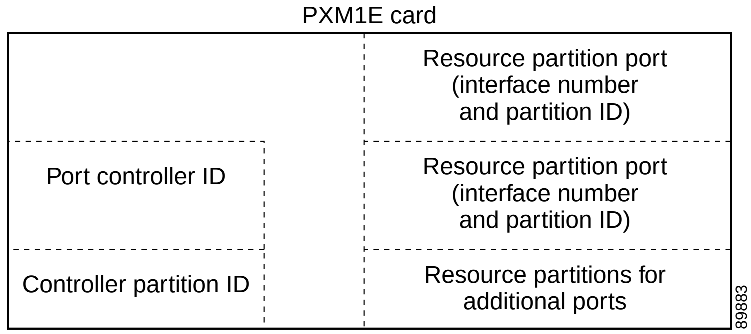


Figure 3-5 shows that the single controller partition connects to the port controller and to the resource partitions. Note that the port controller and the controller partition both reside on the PXM1E card.

After you create a port, you must create a resource partition for that port, select the PNNI controller, and define which ATM resources the port will use. You do not have to create the controller partition, as it is automatically created when you create the first resource partition. It is important that the same controller partition, and therefore the same partition ID, be used for all resource partitions of the same type on the same PXM1E card. For example, the controller is identified by the controller ID and the controller partition is identified by the partition ID. The resource partitions are identified by specifying the partition ID in combination with the port ID (interface number).

To create a resource partition for a port, use the following procedure.

Step 1 Establish a configuration session using a user name with GROUP1 privileges or higher.

> **Note** You must add the PNNI controller and add a port before you create a resource partition for a port. For instructions on adding the controller, see the “Adding the PNNI Controller” section in Chapter 2, “Configuring General Switch Features.” For instructions on adding ports, see the “Adding ATM Ports” section earlier in this chapter.

Step 2 Determine the port number to which you want to assign the resource partition. To display a list of the ports, enter the following command:

```
mgx8830a.1.PXM.a > dspports
```

This command displays all ports on the PXM1E card in the ifNum (interface number) column.

Step 3 To create a resource partition, enter the following command:

```
mgx8830a.1.PXM.a > addpart <ifNum> <partId> <ctrlrId> <egrminbw> <egrmaxbw> <ingminbw>
<ingmaxbw> <minVpi> <maxVpi> <minVci> <maxVci> <minConns> <maxConns>
```

Table 3-10 describes the parameters for this command.

Table 3-10 Parameters for the addpart Command

Parameter	Description
ifNum	Interface number or port number. This number identifies the port this resource partition configures. Enter the interface number that was assigned to the port when it was configured (see the “Adding ATM Ports” section earlier in this chapter).
partId	Partition identification number. Enter a number in the range of 1 to 20. On an PXM1E card, this number must be the same for all ports that use the same controller type. For example, if you assign the number 2 to the PNNI controller on any port, the partition ID for the PNNI controller on all other ports must be set to 2.
ctrlrId	Controller identification number. Enter the number **2** to specify the PNNI controller. For more information, refer to “Adding the PNNI Controller” in Chapter 2, “Configuring General Switch Features.”
egrminbw	Egress minimum bandwidth. Enter the minimum percentage of the outgoing port bandwidth that you want assigned to the specified controller. One percent is equal to .0001 units. For example, an <*egrminbw*> of 250000 = 25%. The sum of the minimum egress bandwidth settings for PNNI must be 100% or less, and must be less than the sum of the egrmaxbw settings.
egrmaxbw	Egress maximum bandwidth. Enter the maximum percentage of the outgoing port bandwidth that you want assigned to the controller. One percent is equal to .0001 units. For example, an <*egrmaxbw*> of 1000000 = 100%. The sum of the maximum egress bandwidth settings for PNNI can exceed 100%, and must be more than the sum of the egrminbw settings. Available bandwidth above the minimum bandwidth settings is allocated to the operating controllers on a first-requested, first-served basis until the maximum bandwidth setting is met or there is insufficient bandwidth to meet the request.
ingminbw	Ingress minimum bandwidth. Enter the minimum percentage of the incoming port bandwidth that you want assigned to the controller. One percent is equal to .0001 units. For example, an <*ingminbw*> of 500000 = 50%. The sum of the minimum ingress bandwidth settings for PNNI must be 100% or less, and must be less than the sum of the ingmaxbw settings.
ingmaxbw	Ingress maximum bandwidth. Enter the maximum percentage of the incoming port bandwidth that you want assigned to the controller. One percent is equal to .0001 units. For example, an <*ingmaxbw*> of 750000 = 75%. The sum of the maximum ingress bandwidth settings for PNNI can exceed 100%, and must be more than the sum of the ingminbw settings. Available bandwidth above the minimum bandwidth settings is allocated to the operating controllers on a first-request, first-served basis until the maximum bandwidth setting is met or there is insufficient bandwidth to meet the request.
minVpi	Minimum VPI. For NNI, the range is 0-4095. For UNI, the range is 0-255.
maxVpi	Maximum VPI in the range 0-4095 for an NNI. For a UNI, the range is 0-255. The maxvpi cannot be less than the minvpi.
minVci	The minimum VCI has a range of 1-65535.
maxVci	Maximum VPI in the range 0-4095 for an NNI. For a UNI, the range is 0-255. The maxvpi cannot be less than the minvpi.

Table 3-10 Parameters for the addpart Command (continued)

Parameter	Description
minConns	Specifies the guaranteed number of connections. On the PXM1E UNI/NNI, the ranges vary according to the line types, as follows: • For OC3, T3, and E3 lines, the range is 10-27000. • For T1 and E1 lines, the range is 10-13500.
maxConns	Specifies the guaranteed number of connections. On the PXM1E UNI/NNI, the ranges vary according to the line types, as follows: • For OC3, T3, and E3 lines, the range is 10-27000. • For T1 and E1 lines, the range is 10-13500.

Step 4 To display a list showing the resource partition you have created, enter the following command:

```
mgx8830a.1.PXM.a > dspparts
```

Step 5 To display the configuration of a specific resource partition, note the interface and partition numbers and enter the following command:

```
mgx8830a.1.PXM.a > dsppart <ifNum> <partId>
```

Table 3-10 describes the parameters for this command.

The following example shows the report provided by the **dsppart** command.

```
mgx8830a.1.PXM.a > dsppart 1 1
  Interface Number               : 1
  Partition Id                   : 1              Number of SPVC: 0
  Controller Id                  : 2              Number of SPVP: 0
  egr Guaranteed bw(.0001percent): 1000000        Number of SVC : 0
  egr Maximum bw(.0001percent)   : 1000000
  ing Guaranteed bw(.0001percent): 1000000
  egr Maximum bw(.0001percent)   : 1000000
  min vpi                        : 0
  max vpi                        : 4095
  min vci                        : 1
  max vci                        : 65535
  guaranteed connections         : 10000
  maximum connections            : 10000
```

Note Partition ID 1 is reserved for PNNI.

Note For more information on working with partitions, see the "Managing PXM1E Partitions" section in Chapter 9, "Switch Operating Procedures."

Selecting the Port Signaling Protocol

The default signaling protocol for all new ports is UNI Version *none*. If you plan to use this protocol on a line, you can accept this default and skip this section. However, if you plan to use a different protocol on the line, such as NNI or PNNI, you must select the correct protocol using the following procedure.

Step 1 Establish a configuration session using a user name with GROUP1 privileges or higher.

Step 2 Enter the **dsppnports** command to display a list of the ports you can configure.

```
mgx8830a.1.PXM.a > dsppnports
```

Step 3 Enter the **dnpnport** command to bring down the port you want to configure.

```
mgx8830a.1.PXM.a > dnpnport <portid>
```

A port is automatically brought up when you add it. You must bring down the port before you can change the port signaling protocol. Replace *<portid>* using the format *slot*[:*bay*].*line*[:*ifNum*]. Table 3-11 describes these parameters.

Step 4 To confirm the port is down, enter the **dsppnports** command. The following example shows the report that appears.

```
mgx8830a.1.PXM.a > dsppnports
Summary of total connections
(p2p=point to point,p2mp=point to multipoint,SpvcD=DAX spvc,SpvcR=Routed spvc)
Type   #Svcc:   #Svpc:   #SpvcD:  #SpvpD:  #SpvcR:  #SpvpR:  #Ctrl #Total:
p2p:   0        0        0        0        1        0        0        1
p2mp:  0        0        0        0        0        0        0        0

    Total(User cons) =       1/27000,   Total(Ctrl cons) = 0
            Total=1

Summary of total SPVC endpoints
(P=Persistent, NP=Non-Persistent)
Type   #SpvcR-P  #SpvcR-NP #SpvpR-P  #SpvpR-NP #SpvcD   #SpvpD   Total
p2p:   2         0         0         0         0         0         2
p2mp:  0         0         0         0         0         0         0
                         Total=2

Summary of total active SVC/SPVC intermediate endpoints
Type   #Svcc     #Svpc     #SpvcR   #SpvpR   Total
p2p:   0         0         1         0         1
p2mp:  0         0         0         0         0
                         Total=1


Type <CR> to continue, Q<CR> to stop:
```

```
DSPPNPORTS          EndPoint Grand Total =      3/54000
Per-port status summary

PortId      LogicalId    IF status      Admin status  ILMI state        #Conns

1.35         16845603    up             up            NotApplicable     0

1.36         16845604    up             up            NotApplicable     0

1.37         16845605    up             up            NotApplicable     0

1.38         16845606    up             up            NotApplicable     0

4.1          16851713    up             up            NotApplicable     1

1:2.1:3      16845571    up             up            NotApplicable     0

1:2.3:1      16845569    up             up            Disable           1
```

Step 5 To select the port signaling protocol, enter the following command:

```
mgx8830a.1.PXM.a > cnfpnportsig <portid> [-univer {uni30|uni31|uni40|q2931|none|self}]
[-nniver {iisp30|iisp31|pnni10|enni|aini}] [-unitype {public|private}] [-addrplan
{both|aesa|e164}] [-side {user|network}] [-vpi <vpi>] [-sigvci <signalling-vci>] [-rccvci
<routing-vci>] [-cntlvc <ip>][-passalongcap {enable|disable}] [-hopcntgen
{enable|disable}] [-vpivcialloc {enable|disable}] [-svcroutingpri <svcroutingPriority>]
```

The only required parameter for this command is the <*portid*> parameter, but the command serves no purpose if you do not enter at least one option with it. If you include some options with the command and omit others, the omitted option remains set to the last configured value.

Table 3-11 shows the components required in the <*portid*> parameter, which is used with many commands. Table 3-12 lists and describes the options and parameters for the **cnfpnportsig** command.

Tip With some commands, you can refer to a port using only the interface number, while other commands require you to enter a complete port identification number, which includes the slot, bay, line, and interface numbers. When entering controller related commands at the PXM1E switch prompt (such as PNNI signaling commands), you always need to specify the complete port identification number. When entering interface related commands at the PXM1E switch prompt, you can enter only the interface number, because the interface number is unique on the PXM1E card and identifies the bay and line for the port.

Table 3-11 Port Identification Parameters

Parameter	Description
slot	Enter the logical slot number for the card that hosts the port you are configuring.
bay	Replace <*bay*> with **2** to indicate that the line is connected to a back card in the lower bay. Remember that the bay number is always **2** for a PXM1E.
line	Replace <*line*> with the number that corresponds to the back card port to which the line is connected.
ifNum	An ATM port is also called an interface. Port or interface numbers are defined when a port is created with the **addport** or **addimaport** commands. You can view configured ATM ports with the **dspports** command.

Table 3-12 Port Signaling Configuration Parameters

Parameter	Description
<portid>	Port identifier in the format *slot*:*bay.line*:*ifnum*. These parameters are described in Table 3-11.
-univer	When configuring PNNI signaling for a UNI port, you can use this option to specify which version of UNI signaling you want the port to use. You can select UNI version 3.0 (**uni30**), UNI version 3.1 (**uni31**), UNI version 4.0 (**uni40**), ENNI (**enni**), or no UNI signaling (**none**). The default value is **none**. For lines that will support ABR SVCs, select **uni40**. The UNI ports at each end of a virtual trunk SPVP must be set to **none**. SPVCs and SPVPs can use UNI 3.x or 4.0 signaling.
-nniver	When configuring PNNI signaling for an NNI port, you can use this option to specify which signaling protocol you want the port to use. You can select IISP version 3.0 (**iisp30**), IISP version 3.1 (**iisp31**), PNNI version 1.0 (**pnni10**), ENNI (**enni**), or AINI (**aini**).
-unitype	When configuring PNNI signaling for a UNI port, you can use this option to specify the UNI type. You can define the port as a private UNI port (**private**) or as a public UNI port (**public**). The default value is **private**.
-addrplan	When configuring PNNI signaling for a UNI port, this parameter specifies the ATM address plan used on this port. You can select AESA (**aesa**), E.164 (**e164**), or both (**both**). The default value is **aesa**.
-side	Defines the role of the signaling service used on the port. This parameter applies to IISP ports when static addressing is used (address registration is disabled). If this is a UNI connection or an NNI connection within the network, select **network**. For connections to other networks, you might need to select **user** (this is negotiated with the administrators of the other network). The default value is **network**.
-vpi	Defines the VPI for signaling services on this port. Enter a value in the range from 0 to 4095. The default value is **0**.
-sigvci	Defines the VCI for signaling services on this port. The default value is **5**, which is the well-known, reserved VCI for signaling services on VPI 0. If you choose another VCI for signaling, choose a VCI value in the range from 32 to 65535. Otherwise, the VCI can conflict with other VCIs in the reserved range from 0 to 31 on VPI 0.
-rccvci	Defines the VCI for the PNNI Routing Control Connection (RCC[1]) on this port. The default value is **18**, which is the well-known, reserved VCI for this services on VPI 0. If you choose another VCI for signaling, choose a VCI value in the range of 32 to 65535. Otherwise, the VCI can conflict with other VCIs in the reserved range from 0 to 31 on VPI 0.
-cntlvc	This option defines a feeder trunk. The syntax for the feeder trunk definition is: `pop20two.7.PXM.a > cnfpnportsig <portid> -cntlvc ip`

Table 3-12 Port Signaling Configuration Parameters (continued)

Parameter	Description
-passalongcap	Pass-along capability: type *enable* or *disable*. With this capability, the port has the ability to pass along unrecognized information elements (IEs) or messages. Enabling or disabling the pass-along capability applies to AINI, IISP, and public UNI. For all other types, the port behaves as if pass-along is enabled—you cannot disable pass-along on the other port types. Default: enable
-hopcntgen	This parameter applies to AINI only. Type the entire word *enable* or *disable*. If you enable hop counting for AINI, the controller generates the hop counter information IE for all setup messages that pass through the interface if this IE does not already exist in the setup message. You must also enable AINI hop count IE for the switch by entering the **cnfainihopcount** command.
-vpivcialloc	This parameter applies to AINI: type *enable* or *disable*. If you enable it, the interface becomes responsible for assigning the VPI and VCI for all connections. if you enable VPI/VCI allocation on one side of the AINI link, allocation must be disabled on the other side of the link,
-svcroutingpri	Assign a routing priority at the port level for SVC, an SPVC, or an SPVP that has no priority. The Routing Priority feature does not support SVCs. However, port-level priority helps with the de-routing of SVCs in a way that supports the Priority Routing feature to re-route SPVCs and SPVPs.

1. Routing Control Connection

Note The selection of UNI or NNI made with the **addport** command has no bearing on whether the pnport can be configured as UNI or NNI using **cnfpnportsig**.

The following example illustrates how to configure an NNI port to use PNNI Version 1.0 signaling.

```
mgx8830a.1.PXM.a > cnfpnportsig 1:2.1:1 -nniver pnni10
```

Step 6 Enter the following command to define the local routing switch feeder port as a non-OAM segment endpoint:

```
mgx8830a.1.PXM.a > cnfoamsegep <portid> <enable_oam_diagnostics>
```

Replace <*portid*> using the format *slot*:*bay.line*:*ifNum*. Replace <*oam diagnostics*> with no to disable OAM diagnostics support. Table 3-11 describes these parameters.

Note This step is required to enable testing with the **tstdelay** command.

Step 7 Enter the following command to bring up the port you just configured:

```
mgx8830a.1.PXM.a > uppnport <portid>
```

Replace <*portid*> using the format *slot*:*bay.line*:*ifNum*. Table 3-11 describes these parameters.

Step 8 To verify the status of the port, enter the **dsppnports** command.

Step 9 To display the configuration of the PNNI port, enter the following command:

```
mgx8830a.1.PXM.a > dsppnport <portid>
```

Replace <*portid*> using the format *slot*:*bay.line*:*ifNum*. Table 3-11 describes these parameters. The following example shows the report for this command.

```
mgx8830a.1.PXM.a > dsppnport 1.35

Port:               1.35              Logical ID:       16845603
IF status:          up                Admin Status:     up
UCSM:               enable            SVC Routing Pri:  8
Auto-config:        enable            Addrs-reg:        enable
IF-side:            network           IF-type:          uni
UniType:            private           Version:          none
PassAlongCapab:     n/a
Input filter:       0                 Output filter:    0
minSvccVpi:         0                 maxSvccVpi:       0
minSvccVci:         35                maxSvccVci:       0
minSvpcVpi:         1                 maxSvpcVpi:       0

       (P=Configured Persistent Pep, NP=Non-Persistent Pep, Act=Active)
       #Spvc-P:  #Spvc-NP:  #SpvcAct:  #Spvp-P:  #Spvp-NP:  #SpvpAct:
p2p :  0         0          0          0         0          0
p2mp:  0         0          0          0         0          0
       #Svcc:     #Svpc:        #Ctrl:     Total:
p2p :  0          0             0             0
p2mp:  0          0             0             0
                                Total:     0
```

Defining Destination Addresses for Static Links

Typically, an AINI or IISP static link joins two independent networks. AINI or IISP links are used instead of PNNI so that the topologies of the two networks remain unknown to the each other.

When you create a static link, you must identify destination addresses for each side of the link. These addresses identify which ATM nodes are accessible on the other side of the link. After you define these addresses, all requests for these addresses are routed over the static link to the other network.

Note To enable bidirectional call initiation, the appropriate destination address must be configured at each end of the link. For example, if nodes A and B have PNNI connections to a static link, the ATM address for Node B must be added to the Node A side of the static link, and the Node A address must be added to the Node B side of the static link.

To add destination addresses to a static link, use the following procedures.

Step 1 Establish a configuration session using a user name with GROUP1 privileges or higher.

Step 2 To locate the port to which you want to add an address, enter the **dsppnports** command.

Step 3 Specify an ATM address using the following command:

```
mgx8830a.1.PXM.a > addaddr <portid> <atm-address> <length> -type ext -proto static [-plan
{e164 | nsap}] [-scope scope] [-redistribute {yes | no}]
```

> **Note** The **addaddr** command is used to define destination addresses for static links and to specify static addresses for links to CPE. The command format above shows the options as they apply when defining destination addresses for static links.

Table 3-13 describes the parameters used with the **addaddr** command.

Table 3-13 ATM Address Configuration Parameters

Parameter	Description
portid	Enter the port identifier in the format slot:bay.line:ifnum. These parameters are described in Table 3-11.
atm-address	Enter the ATM address using up to 40 nibbles. The ATM address can include up to 20 bytes, which is 40 nibbles or 160 bits. To summarize a group of destination addresses, enter an ATM address that is less than 20 bytes and includes the common bytes in the group of destination addresses.
length	Enter the length, in bits, of the address you specified with the <*atm-address*> parameter. Each nibble is equal to 4 bits. The acceptable range for the parameter is from 0 to 160 bits. When you enter a complete 20-byte ATM address, the length is 160. When you summarize a group of destination addresses, the length is equal to the number of bytes entered multiplied by 8.
-type	Enter the address type, which is **ext** (external) for destination addresses on the other side of a static link. The **int** (internal) value is used when creating static addresses for links to CPE. Default = **int**.
-proto	For static link destination addresses, specify the **-proto** option with the **static** value. The **local** value applies to CPE links. Default = **local**.
-plan	Enter the address plan, which is either **e164** (E.164) or **nsap** (NSAP). For an NSAP address, the first byte of the address automatically implies one of the three NSAP address plans: NSAP E.164, NSAP DCC, or NSAP ICD. Default = **nsap**.
-scope	PNNI scope of advertisement. The scope defines the level of the PNNI hierarchy at which this address is advertised. Enter **0** to advertise the destination address to all nodes in the node's peer group. Range: 0 through 104. Default = **0**.
-redistribute	Specifies whether or not the ATM address should be distributed or advertised to PNNI neighbor nodes. Enter **yes** to enable distribution and enter **no** to disable. When this option is set to **yes**, the node distributes the address to the PNNI neighbors defined with the scope option. When set to **no**, the address is not advertised to any other nodes. Default = **no**.

Step 4 To verify that the new address is assigned, enter the following command:

```
mgx8830a.1.PXM.a > dspatmaddr <portid>
```

Replace <*portid*> with the port address using the format *slot*:*bay.line*:*ifnum*. These parameters are described in Table 3-11. For example:

```
mgx8830a.1.PXM.a > dspaddr 2:1.2:2
47.0091.8100.0000.0003.6b5e.30cd.0003.6b5e.30cd.01
length: 160    type: exterior      proto: static
scope: 0       plan: nsap_icd      redistribute: false
```

Assigning Static ATM Addresses to Destination Ports

When a CPE does not support ILMI, the switch cannot automatically determine the CPE address. To enable communications with the CPE, you must assign a static ATM address to the port leading to the CPE. The static address must match the address used by the CPE. When assigning the static address, you can use command options to define how widely the static address is advertised within the switch network. Use the following procedure to define a static address for a UNI port.

Step 1 Establish a configuration session using a user name with GROUP1 privileges or higher.

Step 2 To locate the port to which you want to add an address, enter the **dsppnports** command.

Step 3 Enter the following command to turn off automatic address registration (it is enabled by default) on the port that will use the static address:

```
mgx8830a.1.PXM.a > cnfaddrreg <portid> no
```

Replace *portid* using the format *slot*:*bay.line*:*ifNum*. Table 3-11 describes these parameters.

Step 4 Specify an ATM address for the port using the following command:

```
mgx8830a.1.PXM.a > addaddr <portid> <atm-address> <length> [-type int] [-proto local]
[-plan {e164 | nsap}] [-scope scope] [-redistribute {yes | no}] [-tnid tnid]
```

Note The **addaddr** command is used to specify static addresses for UNI links to CPE and to define destination addresses for AINI and IISP static links. The command format above shows the options that apply when defining static addresses for CPE.

Replace <*portid*> with the ID you used with the **cnfaddreg** command described earlier. Table 3-14 describes the other parameters used with the **addaddr** command.

Note The static ATM address you choose should conform to the address plan for your network. For more information on address planning, refer to the *Cisco PNNI Network Planning Guide for MGX and SES Products*.

Table 3-14 ATM Address Configuration Parameters

Parameter	Description
portid	Port identifier in the format *slot*:*bay.line*:*ifnum*. These parameters are described in Table 3-11.
atm-address	Enter the ATM address using up to 40 nibbles. The ATM address can include up to 20 bytes, which is 40 nibbles or 160 bits.
length	Enter the length, in bits, of the address you specified with the <*atm-address*> parameter. Each nibble is equal to 4 bits. The acceptable range for the parameter is from 0 to 160 bits.
-type	Enter the address type, which is **int** (internal) for CPE static addresses. The **ext** (external) value is used when creating destination addresses for AINI and IISP static links. Note that because the default value is **int**, you do not have to specify this option when defining static CPE addresses. Default = **int**.
-proto	For CPE static addresses, specify the -proto option with the **local** value. The **static** value applies to AINI and IISP static links. Note that because the default value is **local**, you do not have to specify this option when defining static CPE addresses. Default = **local**.
-plan	Enter the address plan, which is either **e164** (E.164) or **nsap** (NSAP). For an NSAP address, the first byte of the address automatically implies one of the three NSAP address plans: NSAP E.164, NSAP DCC, or NSAP ICD. Default = **nsap**.
-scope	PNNI scope of advertisement. The scope defines the level of the PNNI hierarchy at which this address is advertised. Enter **0** to advertise the destination address to all nodes in the node's peer group. Range: 0 to 104. Default = **0**.
-redistribute	Specifies whether or not the ATM address should be distributed or advertised to PNNI neighbor nodes. Enter **yes** to enable distribution and enter **no** to disable. When this option is set to **yes**, the node distributes the address to the PNNI neighbors defined with the scope option. When set to **no**, the address is not advertised to any other nodes. Default = **no**.
-tnid	The transit network ID identifies a network where connections from the current node do not terminate.This number applies to static addresses only. The application of this option depends on the design intent of the user. The ID can have up to four IA5 characters (IA5 is a superset of the ASCII character set).

The following example assigns an ATM address to port 2:2.2:1:

```
mgx8830a.1.PXM.a > addaddr 1:2.1:3 47.1111.1111.1111.1111.1111.1111.1111.1111.1111.11 160
```

Step 5 To verify that the new address has been assigned, enter the **dspatmaddr** command as shown in the following example:

```
mgx8830a.1.PXM.a > dspatmaddr 2:2.2:1

Port Id: 2:2.2:1
Configured Port Address(es) :
 47.1111.1111.1111.1111.1111.1111.1111.1111.1111.11
length: 160    type: internal      proto: local
scope: 0       plan: nsap_icd      redistribute: false
```

Configuring ILMI on a Port

ILMI is optional on most ports. Use ILMI on a port when you want to do any of the following tasks:

- Use ILMI automatic configuration, which negotiates ATM communication parameters
- Use ILMI address registration, which negotiates an ATM address for an attached CPE using an ILMI prefix assigned to the port
- Enable CWM auto-discovery on a link, which allows CWM to search for and discover Cisco Systems switches that it can manage
- Create a PNNI link to a BXM card on a BPX

ILMI is enabled by default on all signaling ports and remains in a down state until ILMI is started. There are two ways to start ILMI on a port. To configure and start ILMI with a single command, use the **cnfilmi** command. To start ILMI using the default values, enter the **upilmi** command. The following sections describe how to

- Configure ILMI traps and signaling and start ILMI
- Configure ILMI automatic configuration
- Configure ILMI dynamic addressing
- Start ILMI with the default trap and signaling parameters

Note For information on additional ILMI management procedures, see the "Managing ILMI"section in Chapter 9, "Switch Operating Procedures."

Configuring ILMI Traps and Signaling

The default ILMI configuration uses the standard ILMI signaling VPI and VCI, sets three ILMI signaling timers, and enables the distribution of ILMI management messages (traps) to SNMP managers such as CWM. If the defaults are acceptable, you can start ILMI on the port entering the **upilmi** command. To change the defaults and start ILMI, use the following procedure.

Note When ILMI is configured and started at one end of a link, it must be configured and started at the other end of the link before the link will operate properly.

Step 1 Establish a configuration session using a user name with GROUP1 privileges or higher.

Step 2 If you want to preview the current ILMI configuration for a port, enter the **dspilmis** command. The following example shows the **dspilmis** command report:

```
mgx8830a.1.PXM.a > dspilmis

    Sig. rsrc  Ilmi  Sig  Sig Ilmi  S:Keepalive T:conPoll K:conPoll
    Port Part State  Vpi  Vci Trap  Interval    Interval  InactiveFactor
    ---- ----  ---- ---- ---- --- ------------  ---------- ----------
    1    1   On      0    16    On          1          5          4
    2    1   Off     0    16    On          1          5          4
    3    1   Off     0    16    On          1          5          4
```

The example above shows that ILMI is enabled on port 1 (ILMI State = On) and is disabled on ports 2 and 3 (ILMI State = Off). All other ILMI parameters are set to the default values.

Note The ILMI state displayed by the **dspilmis** command is the configuration state, not the operational state, which appears when you enter the **dsppnports** or **dsppnilmi** commands.

Step 3 Enter the **cnfilmi** command as follows:

```
mgx8830a.1.PXM.a > cnfilmi -if <ifNum> -id <partitionID> [-ilmi <ilmiEnable>] [-vpi <vpi>]
[-vci <vci>] [-trap <ilmiTrapEnable>] [-s <keepAliveInt>] [-t <pollingIntervalT491>] [-k
<pollInctFact>]
```

Table 3-15 describes the parameters for the **cnfilmi** command.

Table 3-15 cnfilmi Command Configuration Parameters

Parameter	Description
ifNum	Interface number or port number. This number identifies the port on which you are configuring ILMI. Enter the interface number that was assigned with the **addport** command (see “Adding ATM Ports”).
partitionID	Partition ID number. This number identifies the PNNI partition assigned to the port. Enter the partition number that was assigned to the port with the **addpart** command (see “Partitioning Port Resources Between Controllers”). **Note** Partition ID 1 is reserved for PNNI.
ilmiEnable	ILMI enable parameter. To change the current state of ILMI, enter **1** to enable or start ILMI or **2** to disable ILMI. Note that the default value is **1**, which causes ILMI to start whenever the **cnfilmi** command is entered, unless you enter this parameter with value **2**. Default = **1** (enable).
vpi	ILMI signaling VPI. If you need to change the default, enter a VPI number in the range of 0 to 255. Note that changing this value disables ILMI communications until the device at the remote end of the line has been configured for the same ILMI VPI. Default = **0**.

Table 3-15 cnfilmi Command Configuration Parameters (continued)

Parameter	Description
vci	ILMI signaling VCI. If you need to change the default, enter a VCI number in the range of 0 to 65535. Note that changing this value disables ILMI communications until the device at the remote end of the line has been configured for the same ILMI VCI. Default = **16**.
ilmiTrapEnable	ILMI trap distribution. When ILMI is started on a port, ILMI traps are sent to SNMP managers such as CWM. To enable or disable the distribution of ILMI traps, enter **1** to enable ILMI traps or **2** to disable ILMI traps. Default = **1** (enable).
keepAliveInt	ILMI keep alive timer. Range: 1 to 255. Default = **1**.
pollingIntervalT491	ILMI polling interval T491 timer. Range: 0 to 255. Default = **5**. **Note** 0 = no polling
pollInctFact	ILMI polling factor K. Range: 0 to 65535. Default = **4**.

Step 4 To confirm your configuration changes, enter the **dspilmis** command.

Configuring ILMI Automatic Configuration

The Cisco MGX 8850 (PXM1E) and Cisco MGX 8830 switches support the automatic configuration feature of ILMI 4.0, which allows two devices that share a link to share their configurations and negotiate a common set of communication parameters. For example, if two network devices share a link and are configured for different maximum VCIs on a partition, the automatic configuration feature can determine and select the highest common VCI supported by both nodes. To use ILMI automatic configuration, the devices at each end of the link must support this ILMI 4.0 feature.

To enable or disable automatic configuration on a port, enter the **cnfautocnf** command as described in the following procedure.

Note A link between two nodes will not operate correctly if the ILMI automatic configuration feature is enabled at one end and disabled at the other.

Step 1 Establish a configuration session using a user name with GROUP1 privileges or higher.

Step 2 To display the automatic configuration status of a port, use the **dsppnport** command. For example:

```
mgx8830a.1.PXM.a > dsppnport 1:2.3:1
Port:               1:2.3:1           Logical ID:       16845569
IF status:          up                Admin Status:     up
UCSM:               enable            SVC Routing Pri:  8
Auto-config:        enable            Addrs-reg:        enable
IF-side:            network           IF-type:          nni
UniType:            private           Version:          pnni10
PassAlongCapab:     n/a
Input filter:       0                 Output filter:    0
minSvccVpi:         0                 maxSvccVpi:       4095
minSvccVci:         35                maxSvccVci:       65535
minSvpcVpi:         1                 maxSvpcVpi:       4095

       (P=Configured Persistent Pep, NP=Non-Persistent Pep, Act=Active)
       #Spvc-P:  #Spvc-NP:  #SpvcAct:  #Spvp-P:  #Spvp-NP:  #SpvpAct:
p2p :  0         0          0          0         0          0
p2mp:  0         0          0          0         0          0
       #Svcc:     #Svpc:        #Ctrl:     Total:
p2p :  1          0             0             1
p2mp:  0          0             0             0
                                Total:     1
```

The Auto-config field shows whether the automatic configuration feature is enabled or disabled.

Step 3 If you want to enable or disable automatic configuration, bring down the port to be configured with the **dnpnport** command. For example:

```
mgx8830a.1.PXM.a > dnpnport 1:2.3:1
```

Step 4 To enable or disable the automatic configuration feature, enter the **cnfautocnf** command as follows:

```
mgx8830a.1.PXM.a >  cnfautocnf <portid> <yes | no>
```

Replace *portid* with the port address using the format *slot*:*bay.line*:*ifnum*. These parameters are described in Table 3-11.

Enter **yes** to enable automatic configuration or enter **no** to disable automatic configuration. The default is **yes**.

Step 5 Up the port you configured with the **uppnport** command. For example:

```
mgx8830a.1.PXM.a >  uppnport 1:2.3:1
```

Step 6 To verify the change, re-enter the **dsppnport** command.

Configuring ILMI Dynamic Addressing

Dynamic ATM addressing is enabled by default on all PXM1E ports. Once ILMI is started, ILMI can negotiate ATM addresses for CPE connected to the port. To determine the ATM address for the CPE, the switch uses a 13-byte ILMI prefix that is assigned to the port, a 6-byte end system ID, and a 1-byte selector byte. The end system ID and selector byte are defined on the end system. Depending on the end system configuration, the end system ID may correspond with the interface MAC address. For dynamic addressing to work, the remote device must support it. ILMI versions 3.x and 4.0 support dynamic address registration.

The default ILMI prefix matches the PNNI node prefix and the SPVC prefix, both of which are described in the *Cisco PNNI Network Planning Guide for MGX and SES Products*. If you change the PNNI node prefix, the SPVC prefix and the ILMI prefix remain unchanged. If you change the SPVC prefix, the ILMI prefix will change with it, as long as no ILMI prefix is assigned directly to the port. To eliminate the possibility of having a future SPVC prefix change affect dynamic addressing on a port, assign one or more ILMI prefixes to the port.

The following procedure describes how to enable or disable dynamic addressing and how to assign an ILMI address prefix to a port.

Note The Cisco MGX switches support up to 255 ILMI prefixes per PXM1E card, and these prefixes can be assigned to one port or distributed among the ports.

Step 1 Establish a configuration session using a user name with GROUP1 privileges or higher.

Step 2 To display the dynamic addressing status of a port, use the **dsppnport** command. For example:

```
mgx8830a.1.PXM.a > dsppnport 1:2.3:1

Port:               1:2.3:1          Logical ID:      16845569
IF status:          up               Admin Status:    up
UCSM:               enable           SVC Routing Pri:  8
Auto-config:        enable           Addrs-reg:       enable
IF-side:            network          IF-type:         nni
UniType:            private          Version:         pnni10
PassAlongCapab:     n/a
Input filter:       0                Output filter:   0
minSvccVpi:         0                maxSvccVpi:      4095
minSvccVci:         35               maxSvccVci:      65535
minSvpcVpi:         1                maxSvpcVpi:      4095

       (P=Configured Persistent Pep, NP=Non-Persistent Pep, Act=Active)
       #Spvc-P:  #Spvc-NP:  #SpvcAct:  #Spvp-P:  #Spvp-NP:  #SpvpAct:
p2p :  0         0          0          0         0          0
p2mp:  0         0          0          0         0          0
       #Svcc:     #Svpc:        #Ctrl:     Total:
p2p :  1          0             0             1
p2mp:  0          0             0             0
                                Total:     1
```

The Addr-reg field shows whether the dynamic addressing feature is enabled or disabled.

Step 3 To view the ILMI prefixes assigned to a port, enter the **dspprfx** command as follows:

```
mgx8830a.1.PXM.a > dspprfx <portid>
```

Replace *portid* with the port address using the format *slot*:*bay.line*:*ifnum*. These parameters are described in Table 3-11. For example:

```
mgx8830a.1.PXM.a >  dspprfx 1:2.3:1

INFO:  No Prefix registered
```

In the example above, no ILMI prefixes have been assigned to the port, so the port will use the prefix configured for the SPVC prefix.

Step 4 If you want to change the dynamic addressing configuration, bring down the port to be configured with the **dnpnport** command. For example:

```
mgx8830a.1.PXM.a > dnpnport 1:2.3:1
```

Step 5 To enable or disable dynamic address registration, enter the following command:

```
mgx8830a.1.PXM.a > cnfaddrreg <portid> <yes | no>
```

Enter **yes** to enable dynamic address configuration or enter **no** to disable it. The default is **yes**.

Step 6 Enter the following command to define an ATM prefix for a port:

```
mgx8830a.1.PXM.a > addprfx <portid> <atm-prefix>
```

Replace *portid* using the format *slot*:*bay.line*:*ifNum*. Table 3-11 describes these parameters.

Replace *atm-prefix* with the 13-byte ATM address prefix that you want the dynamically assigned address to use. Specify the address prefix using 26 hexadecimal digits. The range for each digit is 0 through F (0 through 9, A, B, C, D, E, and F).

Note The address prefix you choose should conform to the address plan for your network. For more information on address planning, refer to the *Cisco PNNI Network Planning Guide for MGX and SES Products*.

Tip Each hexadecimal digit represents 1 nibble (four bits), and each pair of hexadecimal digits represents a byte. There are 13 pairs of hexadecimal digits in the prefix, or 26 total digits.

Step 7 Up the port you configured with the **uppnport** command. For example:

```
mgx8830a.1.PXM.a > uppnport 1:2.3:1
```

Step 8 To verify the proper ATM prefix configuration for a port, re-enter the **dspprfx** command.

Step 9 To see a dynamically assigned address that uses the prefix, enter the **dspilmiaddr** <*port*> command.

Starting ILMI with the Default or Existing Values

The **upilmi** command starts ILMI on a port with the existing ILMI configuration, which is the default configuration when ILMI has never been configured on that port. Although ILMI starts automatically when you configure it with the **cnfilmi** command, you might have to bring down ILMI with the **dnilmi** command to make a configuration change such as adding an ILMI prefix. To start or restart ILMI with the **upilmi** command, use the following procedure.

Step 1 Establish a configuration session using a user name with GROUP1 privileges or higher.

Step 2 If you do not know the interface number and partition ID for the port on which you are starting ILMI, enter the **dspparts** command as shown in the following example.

```
mgx8830a.1.PXM.a > dspparts
if  part Ctlr egr     egr     ingr    ingr    min max   min   max  min   max
Num ID   ID   GuarBw  MaxBw   GuarBw  MaxBw   vpi vpi   vci   vci  conn  conn
             (.0001%)(.0001%)(.0001%)(.0001%)
----------------------------------------------------------------------------
 1   1    2 1000000 1000000 1000000 1000000    0 4095     1 65535  10000  10000
 3   1    2 1000000 1000000 1000000 1000000    0  255     1 65535   2000   2000
```

Tip To see the relationship between interface numbers and lines, enter the **dspports** command.

Note Partition ID 1 is reserved for PNNI.

Step 3 To start ILMI on a port, enter the **upilmi** command as follows:

```
mgx8830a.1.PXM.a > upilmi <ifNum> <partId>
```

Replace *ifNum* with the interface number for the port, and replace *partId* with the partition number assigned to the port. For example:

```
mgx8830a.1.PXM.a > upilmi 2 1
```

Step 4 To display the ILMI status of all the ports on an PXM1E card, enter the **dspilmis** command. For example:

```
mgx8830a.1.PXM.a > dspilmis

mgx8830a.1.PXM.a > dspilmis

    Sig. rsrc  Ilmi  Sig  Sig Ilmi  S:Keepalive T:conPoll K:conPoll
    Port Part State  Vpi  Vci Trap  Interval    Interval  InactiveFactor
    ---- ----  ---- ---- ---- --- ------------  ---------- ----------
    1    1     On     0    16    On          1          5          4
    3    1     Off    0    16    On          1          5          4
```

The ILMI State column displays the configured state for ILMI, which is On if ILMI is enabled and Off if ILMI is disabled (use **dsppnports** or **dsppnilmi** to see the operational state). The other columns display ILMI configuration parameters described in Table 3-15.

Configuring PXM1E Line Clock Sources

To configure the switch to receive a clock source on an PXM1E line, you must do the following:

- Connect a line between the PXM1E and the node with the clock source.
- Activate the line.
- Create a logical port (subport) for the clock signal.
- Create a resource partition.

Note If you are using NCDP to select the clock path for an MGX switch, you do not need to configure a PXM1E line clock source.

The "Line Configuration Quickstart" section earlier in this chapter describes how to activate a line. The procedures for creating ports and resource partitions also appear earlier in this chapter. The following procedure describes how to configure an PXM1E clock source after the line and port have been configured.

Step 1 Establish a configuration session using a user name with GROUP1 privileges or higher.

Step 2 To set a primary or secondary PXM1E clock source, enter the following command:

```
mgx8830a.1.PXM.a > cnfclksrc <priority> [shelf.]<slot:bay.line:ifnum>
```

Table 3-16 describes the parameters for this command.

Tip To get the correct *slot*:*bay*.*line*:*ifnum* specification, use the port ID displayed by the **dsppnports** command.

Table 3-16 Parameter Descriptions for cnfclksrc Command when Used for PXM1E

Parameter	Values	Descriptions
priority	primary or secondary	Replace *priority* with the type of clock source, which is either **primary** or **secondary**. The default is **primary**.
shelf	1	The *shelf* value is always 1, and it is optional.
slot	1 or 2 on a Cisco MGX 8830 7 or 8 on a Cisco MGX 8850 (PXM1E)	The slot identifies the slot number of the PXM1E card that is receiving the clock signal.
bay	1 or 2 on a Cisco MGX 8830 7 or 8 on a Cisco MGX 8850 (PXM1E)	The *bay* identifies the bay in which the back card is installed. If the clock source line is connected to upper card, enter **1**. If it is connected to the lower card, enter **2**. The default is **1** In a PXM1E card, the clock source line is always connection to the back card in the lower bay (**2**).
line	1 to 16	The *line* number corresponds to the line number on the back card. The line must already be active (using **upln**).
ifnum	1 to 31	The *ifnum* number corresponds to the interface number or logical port number, which is from 1 to 31. The interface number must have been previously defined using the **addport** or **addimaport** commands. **Note** If an IMA port is chosen as the clock source, the actual clock is derived from one of the links in the IMA group. The source link is called the Transmit Reference Link (TRL).

Step 3 To configure an additional clock source, repeat Step 2 using the correct parameters for the additional source.

The following command example shows how to configure a secondary clock source for subport (logical port) 10 on line 1 of the PXM1E card in slot 1. Note the placement of the periods and colons.

```
mgx8830a.1.PXM.a > cnfclksrc secondary 1:2.1:10
```

Verifying PNNI Communications

After setting up trunks or when problems occur, use the procedures in this section to determine if PNNI is operating. The next section describes how to verify PNNI communications on a single trunk. The following section describes how to verify PNNI communications between two nodes, which can be separated by multiple PNNI links.

Verifying PNNI Trunk Communications

After you configure both ends of a PNNI trunk, it should be ready to support SVCs and any SPVCs or SPVPs that are configured. To verify that the trunk is functioning, use the following procedure.

Step 1 Establish a CLI session using a user name at any access level. When both ends of the trunk are connected to Cisco MGX 8850 (PXM1E/PXM45) switches, you can start the CLI session at either end.

Step 2 If you do not know the line number you are validating, you can view the port and line numbers by entering the **dsppnports** command. The first three numbers identify the slot, bay, and line. For example, port 10:2.1:3 represents slot 10, bay 2, line 1. The remaining number is the interface number assigned with the **addport** command.

Step 3 Enter the **dsppnni-link** command as follows:

```
mgx8830a.1.PXM.a > dsppnni-link
```

The **dsppnni-link** command displays a report for every PNNI link on the switch. The following example shows the report for a switch with a single PNNI link.

```
mgx8830a.1.PXM.a > dsppnni-link
node index   : 1
Local port id:   16845569          Remote port id:   17176579
Local Phy Port Id: 1:2.3:1
   Type. lowestLevelHorizontalLink     Hello state....... twoWayInside
   Derive agg...........         0     Intf index...........  16845569
   SVC RCC index........         0     Hello pkt RX.........      1505
                                       Hello pkt TX.........      1498
   Remote node name.......porche
   Remote node id.........56:160:47.00918100000000036b5e2b1f.00036b5e2b1f.01
   Upnode id..............0:0:00.000000000000000000000000.000000000000.00
   Upnode ATM addr........00.000000000000000000000000.000000000000.00
   Common peer group id...00:00.00.0000.0000.0000.0000.0000.00
```

In the **dsppnni-link** command report, there should be an entry for the port for which you are verifying communications. The Local Phy Port Id field in this entry displays the port id in the same format shown in the **dsppnports** command report. The Hello state reported for the port should be twoWayInside and the Remote note ID should display the remote node ATM address after the second colon.

In the example above, the report shown is for port 1:1.1:1. The Hello state is twoWayInside, and the ATM address of the node at the other end of the link is 47.00918100000000107b65f33c.00107b65f33c.01. This link is ready to support connections between the two switches.

Tip If the Hello state for the link is oneWayInside, that side is trying to communicate. Check the status at the other end. Remember that the configuration at each end of the trunk must be compatible with that on the other end. For example, if ILMI auto configuration is configured at one end and not at the other, the Hello state cannot change to twoWayInside or twoWayOutside.

Verifying End-to-End PNNI Communications

When connections between two nodes travel over multiple trunks, use the following steps to verify that the PNNI communications path is operational.

Step 1 Establish a CLI session using a user name at any access level. When both ends of the communications path are connected to Cisco MGX 8850 (PXM1E/PXM45) switches, you can start the CLI session at either end.

Step 2 To display information on all accessible nodes, enter the **dsppnni-node-list** command as shown in the following example:

```
mgx8830a.1.PXM.a > dsppnni-node-list

node #  node id                                            node name    level
------- -------------------------------------------------- ---------- -------
    1   56:160:47.00918100000000164444494.000164444494.01 ferrari       56

node #  node id                                            node name    level
------- -------------------------------------------------- ---------- -------
     2   56:160:47.00918100000000036b5e2b1f.00036b5e2b1f.01 porche         56
```

If a switch appears in this list, you have verified communications with it.

Step 3 To display additional information on the local switch, use the **dsppnni-node** command. For example.

```
mgx8830a.1.PXM.a >  dsppnni-node

node index: 1                      node name: mgx8830a
   Level...............        56     Lowest..............      true
   Restricted transit..       off     Complex node........       off
   Branching restricted        on
   Admin status........        up     Operational status..        up
   Non-transit for PGL election..       off
   Node id...............56:160:47.00918100000000164444494.000164444494.01
   ATM address...........47.00918100000000164444494.000164444494.01
   Peer group id.........56:47.00.9181.0000.0000.0000.0000.00
```

Step 4 To display additional information on remote switches, enter the **dsppnni-reachable-addr** command as follows:

```
mgx8830a.1.PXM.a >  dsppnni-reachable-addr network

scope...............         0     Advertising node number         2
Exterior............     false
ATM addr prefix.....47.0091.8100.0000.0003.6b5e.2b1f/104
Transit network id..
Advertising nodeid..56:160:47.00918100000000036b5e2b1f.00036b5e2b1f.01
Node name...........porche
```

The remote node ATM address appears in the Advertising nodeid row. The information before the first colon (56) is the PNNI level, the information between the first and second colons (160) is the ATM address length, and the remainder of the node ID is the ATM address for the remote node.

Tip If you cannot verify communications with a remote node, try verifying communications across each of the links between the nodes as described in the previous section, "Verifying PNNI Trunk Communications."

Provisioning and Managing SPVCs and SPVPs

The following sections describe the following tasks:

- Configuring Point-to-Point Connections
- Configuring Point-to-Multipoint Connections
- Adding Parties to a P2MP Root Connection
- Obtaining the NSAP for a Party
- Displaying a List of Connections
- Displaying the Status of a Single Connection
- Modifying P2P and P2MP Connections
- Bringing Down a Connection
- Bringing Up a Connection
- Bringing Down a Party
- Bringing Up a Party
- Rerouting Connections
- Rerouting a P2MP Party
- Deleting Connections
- Deleting a P2MP Party

Configuring Point-to-Point Connections

Point-to-point SPVCs and SPVPs are created between two ATM CPE and must be configured at each endpoint. The master endpoint is responsible for routing and rerouting. The slave endpoint is responsible for responding to requests from the master during connection setup and rerouting. Both endpoints are configured on the switch to which the ATM CPE connects. These endpoints can be on the same switch or on different switches.

The master and slave relationships exist for each SPVC or SPVP and apply only to that SPVC or SPVP connection. For example, you can have one SPVC with a master on Node A and a slave on Node B, and then create another with the Master on Node B and the slave on Node A. It is good practice to distribute the master side of SPVCs and SPVPs among the network nodes so that route processing is distributed.

Cisco MGX switches support two types of SPVCs/SPVPs:

- Single-ended SPVCs
- Double-ended SPVCs

Single-ended SPVCs are defined at the master endpoint and do not require configuration of a slave endpoint. The primary benefit of single-ended SPVCs is that they are easier to configure. After configuration, the master endpoint configures and brings up the slave endpoint. In order for this feature to work correctly, the destination endpoint must support single-ended SPVCs.

Single-ended SPVCs are non-persistent.

Double-ended SPVCs and SPVPs require separate configuration of the master and slave endpoints. The slave endpoint must be configured first because this step generates a slave address that must be entered during master endpoint configuration.

The following sections describe how to configure slave and master SPVC and SPVP connections.

Tip The configuration of SPVCs and SPVPs is very similar. The difference is that SPVPs are assigned VCI 0 and do not use nonzero VCI numbers. An SPVC requires a nonzero VCI.

Configuring the Slave Side of SPVCs and SPVPs

To configure the slave side of an SPVC or SPVP, use the following procedure.

Step 1 Establish a configuration session using a user name with GROUP1 privileges or higher.

Step 2 Define the slave side of the SPVC by entering the following command:

```
PXM1E_SJ.8.PXM.a > addcon <ifNum> <vpi> <vci> <serviceType> <mastership>
[-slave atmAddr.vpi.vci] [-lpcr <cellrate>] [-rpcr <cellrate>] [-lscr <cellrate>]
[-rscr <cellrate>] [-lmbs <cells>] [-rmbs <cells>] [-lcdv <time>] [-rcdv <time>]
[-lctd <time>] [-rctd <time>] [-lmcr <cellrate>] [-rmcr <time>]
[-cdvt <time>] [-cc <1|0>] [-stat <1|0>] [-frame <1|0>] [-mc <maxCost>]
[-lputil <percentage>]  [-rputil <percentage>]
[-slavepersflag <persistent|nonpersistent>]  [-rtngprio <routingpriority>]
[-prefrte <preferredRouteId>]  [-intvsvd <internal vsvd config>]
[-extvsvd <external vsvd config>][-directrte <directRoute>]
```

Caution Once you create an SPVC connection, you cannot change the SPVC prefix until all SPVC connections have been deleted. The procedure for changing the SPVC prefix is described in the "Setting and Viewing the SPVC Prefix" section in Chapter 2, "Configuring General Switch Features."

Table 3-17 lists and defines the parameters and options for the **addcon** command. The local and remote terms used in Table 3-17 refer to settings for the local port you are configuring and the remote port at the other end of the connection. If you omit an option, the SPVC uses the default value.

Table 3-17 Parameters for the addcon and cnfcon Commands

Parameter	Commands	Description
ifNum	addcon, cnfcon	Enter the interface number (which is defined with the **addport** command) for the port to which this SPVC will connect. The range is from 1 to 31.
vpi	addcon, cnfcon	Enter the VPI for the slave side of the SPVC. UNI Range: 0 to 255. NNI Range: 0 to 4095.
vci	addcon, cnfcon	Enter the VCI for the slave side of the SPVC or SPVP. SPVC Range: 32 to 65535. SPVP Range: 0. **Note** Cisco recommends setting the minimum VCI to 35 or higher. Future products will use VCI 32 through 34 for other services.

Table 3-17 Parameters for the addcon and cnfcon Commands (continued)

Parameter	Commands	Description
serviceType	addcon	Replace <*serviceType*> with the number that corresponds to the requested service type for this SPVC (this value must be identical on master and slave sides). Possible service types and their corresponding numbers are as follows: • cbr1 = **1** • vbr1rt = **2** • vbr2rt = **3** • vbr3rt = **4** • vbr1nrt = **5** • vbr2nrt = **6** • vbr3nrt = **7** • ubr1 = **8** • ubr2 = **9** • abrstd = **10** • cbr2 = **11** • cbr3 = **12**
mastership	addcon	Enter **2** or **s** if this port will serve as the slave side of the connection. Enter **1** or **m** if the port serves as the master side of the connection.
-*casttype*	addcon	The connection type is either point-to-point or point-to-multipoint, as follows: • Point-to-point = 0 • Point-to-multipoint = 1 (valid only for master connection endpoints) Default: point-to-point (0)
-*slave*	addcon	Keyword for the slave-end identifier, an item you enter at the master end. This keyword is mandatory when you are adding a master endpoint (mastership=m or 1).
-lpcr	addcon, cnfcon	Local peak cell rate (PCR). Specifies the PCR from a local endpoint to a remote endpoint (3-5651328 cells per second). PCR is the maximum cell rate for the connection at any time.
-rpcr	addcon, cnfcon	Remote peak cell rate (PCR). Specifies the PCR from a remote endpoint to a local endpoint (3-5651328 cells per second). PCR is the maximum cell rate for the connection at any time.
-lscr	addcon, cnfcon	Local sustained cell rate (SCR). Specifies the SCR from a local endpoint to a remote endpoint (3-5651328 cells per second). SCR is the maximum cell rate that a connection can sustain for long periods.

Table 3-17 Parameters for the addcon and cnfcon Commands (continued)

Parameter	Commands	Description
-rscr	addcon, cnfcon	Remote sustained cell rate (SCR). Specifies the SCR from a remote endpoint to a local endpoint (3-5651328 cells per second). SCR is the maximum cell rate that a connection can sustain for long periods.
-lmbs	addcon, cnfcon	Specifies the MBS from a local endpoint to a remote endpoint, in the range from 1-5000000 cells. MBS is the maximum number of cells that can burst at the PCR and still be compliant. In the operation of the GCRA (Generic Cell Rate Algorithm), the MBS and SCR are closely related in the generation of the burst tolerance. According to buffering and the correct operation of the ATM chipset, the maximum MBS is derived from the configured SCR, and the relative values of SCR and PCR. The maximum obtained MBS will reduce as the SCR becomes lower, and as the gap between PCR and SCR gets larger.
-rmbs	addcon, cnfcon	Specifies the MBS from a remote endpoint to a local endpoint, in the range from 1-5000000 cells. MBS is the maximum number of cells that can burst at the PCR and still be compliant. In the operation of the GCRA (Generic Cell Rate Algorithm), the MBS and SCR are closely related in the generation of the burst tolerance. According to buffering and the correct operation of the ATM chipset, the maximum MBS is derived from the configured SCR, and the relative values of SCR and PCR. The maximum obtained MBS will reduce as the SCR becomes lower, and as the gap between PCR and SCR gets larger.
-lcdv	addcon, cnfcon	The local cell delay variation (CDV) parameter specifies the maximum peak-to-peak CDV allowed from the local endpoint to the remote endpoint. The range is 0 to 16777215 microseconds.
-rcdv	addcon, cnfcon	The remote CDV parameter specifies the maximum peak-to-peak CDV from the remote endpoint to the local endpoint. The range is 0 to 16777215 microseconds.
-lctd	addcon, cnfcon	The local CTD parameter specifies the maximum cumulative CTD allowed from a local endpoint to a remote endpoint. The range is 0 to 65535 milliseconds.
-rctd	addcon, cnfcon	The remote CTD parameter specifies the maximum cumulative CTD allowed from the remote endpoint to the local endpoint. The range is 0 to 65535 milliseconds.
-lmcr	addcon, cnfcon	Local minimum cell rate OC3: 50 – 353207 cps T3: 50 – 96000 (PLCP) cps or 104268 (ADM) cps E3: 50 – 80000 cps T1: 50-3622 cps E1: 50-4528 cps

Table 3-17 Parameters for the addcon and cnfcon Commands (continued)

Parameter	Commands	Description
-rmcr	addcon, cnfcon	Remote minimum cell rate. OC3: 50 – 353207 cps T3: 50 – 96000 (PLCP) cps or 104268 (ADM) cps E3: 50 – 80000 cps T1: 50-3622 cps E1: 50-4528 cps
-cdvt	addcon, cnfcon	Local cell delay variation tolerance (CDVT). Specifies the CDVT from a local endpoint to a remote endpoint (1-5000000 microseconds). Cell Delay Variation Tolerance controls the time scale over which the PCR is policed. No remote CDVT is necessary.
-cc	addcon, cnfcon	This option enables or disables the flow of Operation, Administration, and Maintenance Continuity Check (OAMCC) traffic on the connection. Enter **1** to enable OAM traffic flow, or enter **0** to disable traffic flow. Note that when this option is enabled on only one side of a connection, a transient alarm is reported until this option is set to the same value at both ends. Default: **0**, disabled.
-stat	addcon, cnfcon	This option enables or disables statistics collection for the SPVC. Enter **1** to enable OAM statistics collection, or enter **0** to disable it. Default: **0**, disabled.
-frame	addcon, cnfcon	This option enables or disables frame discard. Enter **1** to enable frame discard, or enter **0** to disable it. Default: **0**, disabled.
-mc	addcon, cnfcon	The maximum cost parameter defines a maximum acceptable cost value to the connection. When a maximum cost is specified, the cumulative AW for a connection must be less than the maximum cost. Range: 0 to 4294967295 Default: -1, no maximum cost specified for the route.
-segep	cnfcon	OAM segment endpoint. This option enables (**1**) or disables (**0**) operation of the connection endpoint as an OAM segment endpoint.

Table 3-17 Parameters for the addcon and cnfcon Commands (continued)

Parameter	Commands	Description
-lputil	addcon, cnfcon	The local percentage utilization option specifies a *percentage utilization factor* (which is also called an overbooking factor) that enables or disables overbooking for a connection. This is a Cisco proprietary feature that was introduced in Release 3.0 and works only with other Cisco MGX and SES devices. When a connection is set up, connection admission control (CAC) accepts or rejects a connection's request for bandwidth by comparing the request to the available bandwidth. Connection overbooking allows a connection to specify a lower bandwidth requirement for CAC than the actual amount it reserves. If this parameter is set to 100 percent, overbooking is disabled and the bandwidth used for CAC is equal to the reserved bandwidth. If this parameter is set to a value less than 100 percent, the connection uses overbooking. The connection calculates the bandwidth used for CAC for each class of service as follows: CBR: PCR * percentage utilization factor rt-VBR: SCR * percentage utilization factor nrt-VBR: SCR * percentage utilization factor ABR: MCR * percentage utilization factor UBR: zero Range: 1 to 100 percent.
-rputil	addcon, cnfcon	The remote percentage utilization option specifies a *percentage utilization factor* (which is also called an overbooking factor) that enables or disables overbooking for a connection. This options works the same as the **-lputil** option, except that it applies to communications from a remote device to the local device.
-slavepersflag	addcon	This option determines the persistency of the endpoint: • 0 = persistent • 1 = nonpersistent
-rtngprio	addcon, cnfcon	This option determines the routing priority for the specified connection. The range is from 1 through 15, where 1 is the highest priority and 15 is the lowest priority. Default: 8

Table 3-17 Parameters for the addcon and cnfcon Commands (continued)

Parameter	Commands	Description
-prefrte	addcon, cnfcon	This option selects a preferred route ID for the connection. To disassociate a connection from a route, select preferred route ID=0. **Note** An SPVC can be associated with one preferred route. For an XPVC, you can associate the preferred route with only the SPVC portion of the XPVC. Range: 0-65535 Default: 0
-intvsvd	addcon	Internal VSVD configuration. • Off = 1 • On = 2 • Unspecified = 3
-extvsvd	addcon	External VSVD configuration. • Off = 1 • On = 2 • Unspecified = 3
-directrte	addcon, cnfcon	This parameter specifies that the connection can take only the preferred route associated through the -prefrte parameter. Use this optional parameter at the master endpoint only. To remove this requirement from the connection, use the **cnfcon** command and specify a 0 for the parameter. The possible values are as follows: 1: yes (make the preferred route required) 0: no (do not require the connection to take the preferred route) Default: no (0)

Tip The PCR, MBS, CDVT, CDV, MCR, and CTD configuration parameters for the **addcon** and **cnfcon** commands are optional. If you omit one of these options when entering the **addcon** command, the connection uses the default value listed in Table 3-17. To override the default values for any option, enter the option with a new value.

Note You can configure additional ABR parameters with the **cnfabr** and **cnfabrtparmdft** commands. For more information, refer to the *Cisco MGX 8850 (PXM45/PXM1E), Cisco MGX 8950, Cisco MGX 8830, and Cisco MGX 8880 Command Reference, Release 5*.

The following command example defines a port as the slave side of an SPVC. Note the slave id shown in the command response.

```
PXM1E_SJ.8.PXM.a > addcon 11 125 125 1 2
slave endpoint added successfully
slave endpoint id : 47009181000000000001A533377000001073B0B00.125.125
```

Step 3 Write down the slave ID (which includes the NSAP address, VPI, and VCI) the switch displays when the **addcon** command is complete. You will need this to configure the master side of the SPVC.

Tip When you set up the master side of the connection, enter the slave ID reported by the **addcon** command. If you maintain the current session or use the session **Copy** command to copy the ATM address now, you can use the session **Paste** command to complete the **addcon** command on the switch that hosts the master side of the connection.

Step 4 Verify the slave-side SPVC addition by entering the following command:

```
PXM1E_SJ.8.PXM.a > dspcons
```

The switch displays a report similar to the following:

```
PXM1E_SJ.8.PXM.a > dspcons

Local Port   Vpi.Vci    Remote Port  Vpi.Vci     State     Owner  Pri Persistency
----------------------+-----------------------+---------+-------+---+-----------
4.1            4 35     Routed        26 35      OK        MASTER 8   Persistent
Local  Addr: 47.00918100000000001a533377.000001072301.00
Remote Addr: 47.009181000000000164444b61.00000107d301.00
Preferred Route ID:-    Cast Type: P2P
4.2            4 36     Routed        26 36      OK        SLAVE  -   Persistent
Local  Addr: 47.00918100000000001a533377.000001072302.00
Remote Addr: 47.009181000000000164444b61.00000107d302.00
Preferred Route ID:-   Cast Type: P2P
11.1          11 119    11.5          11 120     OK        SLAVE  -   Persistent
Local  Addr: 47.00918100000000001a533377.000001075b01.00
Remote Addr: 47.00918100000000001a533377.000001075b05.00
Preferred Route ID:-   Cast Type: P2P
11.5          11 120    11.1          11 119     OK        MASTER 8   Persistent
Local  Addr: 47.00918100000000001a533377.000001075b05.00
Remote Addr: 47.00918100000000001a533377.000001075b01.00
Preferred Route ID:-    Cast Type: P2P
7:2.11:11    100 100    Routed         0 0       OK        MASTER 8   Persistent
Local  Addr: 47.00918100000000001a533377.000001073b0b.00
Remote Addr: 00.000000000000000000000000.000000000000.00
Preferred Route ID:-    Cast Type: P2MP
7:2.11:11    125 125    Routed         0 0       FAIL      SLAVE  -   Persistent
Local  Addr: 47.00918100000000001a533377.000001073b0b.00
Remote Addr: 00.000000000000000000000000.000000000000.00
Preferred Route ID:-   Cast Type: P2P
```

Configuring the Master Side of SPVCs and SPVPs

To configure the master side of an SPVC, use the following procedure.

Step 1 Establish a configuration session using a user name with GROUP1 privileges or higher.

Tip During this procedure, you will have to enter the ATM address for the slave end of the connection. If you establish this session from the same workstation you used to create the slave connection, you can use the **Copy** and **Paste** commands to avoid data entry errors.

Step 2 Enter the following command to select the PXM1E card that hosts the master side of the SPVC:

```
PXM1E_SJ.8.PXM.a > cc <slotnumber>
```

Step 3 Define the master side of the SPVC by entering the **addcon** command:

```
PXM1E_SJ.8.PXM.a > addcon <ifNum> <vpi> <vci> <serviceType> <mastership>
[-casttype <casttype>] [-lpcr <cellrate>] [-rpcr <cellrate>] [-lscr <cellrate>]
[-rscr <cellrate>] [-lmbs <cells>] [-rmbs <cells>] [-cdvt <time>]
[-lcdv <time>] [-rcdv <time>] [-lctd <time>] [-rctd <time>]
[-cc <1|0>] [-stat <1|0>] [-frame <1|0>] [-mc <maxCost>] [-lputil <percentage>]
[-rputil <percentage>]  [-slavepersflag <persistent|nonpersistent>]
[-routingprio <routingpriority>]
```

Note If you omit an optional parameter, the SPVC/SPVP uses the default value.

Table 3-17 lists and defines the parameters and options for this command. If you omit an option, the SPVC uses the default value.

Tip The PCR, MBS, CDVT, CDV, MCR, and CTD options are optional. If you omit one of these options when entering the **addcon** command, the connection uses the default value listed in Table 3-17. To override the default values for any option, enter the option with a new value.

The following command example defines a port as the master side of an SPVC. Note the master id shown in the command response.

```
PXM1E_SJ.8.PXM.a > addcon 12 135 135 1 1 -slave
47009181000000001A533377000001073B0B00.125.125
master endpoint added successfully
master endpoint id : 47009181000000001A533377000001073B0C00.135.135
```

Note To designate priority routing for this SPVC, you need to include the **-routingprio** *<routingpriority>* option with the **addcon** command in this step.

Step 4 Verify the master-side SPVC addition by entering the following command:

```
PXM1E_SJ.8.PXM.a > dspcons
```

The switch displays a report showing all connections as shown in the following example:

```
PXM1E_SJ.8.PXM.a > dspcons

Local Port   Vpi.Vci    Remote Port  Vpi.Vci     State     Owner  Pri Persistency
---------------------+----------------------+---------+-------+---+-----------
4.1            4 35     Routed        26 35      OK        MASTER 8   Persistent
Local  Addr: 47.00918100000000001a533377.000001072301.00
Remote Addr: 47.009181000000000164444b61.00000107d301.00
Preferred Route ID:-    Cast Type: P2P
4.2            4 36     Routed        26 36      OK        SLAVE  -   Persistent
Local  Addr: 47.00918100000000001a533377.000001072302.00
Remote Addr: 47.009181000000000164444b61.00000107d302.00
Preferred Route ID:-   Cast Type: P2P
11.1          11 119    11.5          11 120     OK        SLAVE  -   Persistent
Local  Addr: 47.00918100000000001a533377.000001075b01.00
Remote Addr: 47.00918100000000001a533377.000001075b05.00
Preferred Route ID:-   Cast Type: P2P
11.5          11 120    11.1          11 119     OK        MASTER 8   Persistent
Local  Addr: 47.00918100000000001a533377.000001075b05.00
Remote Addr: 47.00918100000000001a533377.000001075b01.00
Preferred Route ID:-    Cast Type: P2P
7:2.11:11    100 100    Routed         0 0       OK        MASTER 8   Persistent
Local  Addr: 47.00918100000000001a533377.000001073b0b.00
Remote Addr: 00.000000000000000000000000.000000000000.00
Preferred Route ID:-    Cast Type: P2MP
7:2.11:11    125 125    7:2.12:12    135 135     OK        SLAVE  -   Persistent
Local  Addr: 47.00918100000000001a533377.000001073b0b.00
Remote Addr: 47.00918100000000001a533377.000001073b0c.00
Preferred Route ID:-   Cast Type: P2P
7:2.12:12    135 135    7:2.11:11    125 125     OK        MASTER 8   Persistent
Local  Addr: 47.00918100000000001a533377.000001073b0c.00
Remote Addr: 47.00918100000000001a533377.000001073b0b.00
Preferred Route ID:-    Cast Type: P2P
```

Step 5 To display the configuration for a single connection, enter the following command:

```
PXM1E_SJ.8.PXM.a > dspcon ifNum vpi vci
```

Replace the *ifNum* parameter with the interface or port number. The *vpi* and *vci* parameters are described in Table 3-17. The following example shows a **dspcon** command report.

```
PXM1E_SJ.8.PXM.a > dspcon 7:2.12:12 135 135
Port                    Vpi Vci            Owner      State      Persistency
----------------------------------------------------------------------------
Local  7:2.12:12       135.135             MASTER     OK         Persistent
       Address: 47.00918100000000001a533377.000001073b0c.00
       Node name: PXM1E_SJ
Remote 7:2.11:11       125.125             SLAVE      OK         Persistent
       Address: 47.00918100000000001a533377.000001073b0b.00
       Node name: PXM1E_SJ

-------------------- Provisioning Parameters --------------------
Connection Type: VCC         Cast Type: Point-to-Point
Service Category: CBR        Conformance: CBR.1
Bearer Class: BCOB-X
Last Fail Cause: No Fail                         Attempts: 0
Continuity Check: Disabled    Frame Discard: Disabled
L-Utils: 100   R-Utils: 100   Max Cost: -1    Routing Cost: 0 (N/A)
OAM Segment Ep: Enabled
Pref Rte Id: 0                Directed Route: No
Priority: 8                   Num Parties: -
```

```
---------- Traffic Parameters ----------
Values: Configured (Signalled)
Tx PCR:  50        (50       )     Rx PCR:  50        (50        )
Tx CDVT: 250000    (250000   )
Tx CDV:  -1        (-1       )     Rx CDV:  -1        (-1        )
Tx CTD:  -1        (-1       )     Rx CTD:  -1        (-1        )

-------------------- Preferred Route Parameters------------------
Currently on preferred route: N/A

-------------------- Others ------------------------------------
SM: Record Number: 2, ATM

-------------------- Soft Reroute Parameters------------------
Negotiated Slave Soft Reroute Capability: DISABLE
Soft Reroute Last Cause: N/A.  Soft Reroute is not performed yet.
```

The -1 entries in the example above indicate that a value was not specified with the **addcon** command. The N/A entries indicate that a value is not applicable to connections with this service type.

Configuring Point-to-Multipoint Connections

In point-to-multipoint (P2MP) connections, one master connection endpoint, or *root*, can be configured to connect to multiple slave endpoints, or *parties*.

P2MP SPVCs and SPVPs are created between a root endpoint and multiple ATM CPEs. During P2MP connection setup and rerouting, the root is responsible for routing and rerouting, and the parties are responsible for responding to requests from the master. The root and its parties are configured on the switch to which the ATM CPE connects. These endpoints can be on the same switch or on different switches.

P2MP functionality is necessary for the following applications:

- data and video broadcast
- LAN emulation

The procedures in this section describe how to configure P2MP connections on a PXM1E. For more detailed information on planning and establishing P2MP connections in a PNNI network, refer to the *Cisco PNNI Network Planning Guide for MGX and SES Products.*

Keep the following in mind when configuring P2MP connections on Cisco MGX 8850 (PXM1E) and Cisco MGX 8830 switches:

- CBSMs cannot originate or terminate P2MP connections.
- ABR P2MP connections are not supported.
- P2MP connections support uni-directional traffic in the root-to-leaf direction only. Leaf-to-root traffic is not supported.
- Unicast (P2P) traffic has a higher priority than multi-cast (P2MP) traffic. P2MP connections have a default routing priority of 8.
- P2MP connections do support CUGs.
- For a P2MP connection, the root can be on any port that supports slot multicasting. The port that is the root of the connection does not need to support port multicasting. A port on which multiple parties are assigned must support port multicasting. For example, if you add a second party on a port that does not support port multicasting, the connection will not route.

- All configuration for P2MP connections is done at the root.You can not do any configuration on the remote (slave) end of the connection. Any attempt to specify parameters for the remote end will be blocked.
- An overview of P2MP, specifications for P2MP connection limits, and multicast support information is published in the *Cisco PNNI Network Planning Guide for MGX and SES Products*.

The establishment of a P2MP connection is a two-step process:

1. Set up the master endpoint, or *root*, of the connection.
2. Add parties to the root of the connection.

Tip The configuration of SPVCs and SPVPs is very similar. The difference is that SPVPs are assigned VCI 0 and do not use nonzero VCI numbers. An SPVC requires a nonzero VCI.

The following procedure describes how to configure the root of a P2MP connection. The procedure that describes how to add parties to a connection appears later in this chapter.

Step 1 Establish a configuration session using a user name with GROUP1 privileges or higher.

Step 2 At the active PXM1E prompt, enter the **addcon** command to establish the master end-point, or root, of a P2MP connection, as shown in the following example. Be sure to include the **-casttype 1** option to specify that this connection is a P2MP connection.

```
PXM1E_SJ.8.PXM.a > addcon <ifNum> <vpi> <vci> <serviceType> <mastership> -casttype 1
```

Table 3-17 lists and defines the parameters and options for the **addcon** command. If you omit an option, the SPVC uses the default value.

In the following example, the root of a P2MP connection is set up on interface 11, on VPI 100 and VCI 100.

```
PXM1E_SJ.8.PXM.a > addcon 11 100 100 1 1 -casttype 1
master endpoint added successfully
master endpoint id : 47009181000000000001A533377000001073B0B00.100.100
```

Step 3 Enter the **dspcon** <*portid*> <*vpi*> <*vci*> command to verify that the root was established properly. The <*portid*>, <*vpi*>, and <*vci*> parameters identify the root connection and are the same as those described in Table 3-18.

Adding Parties to a P2MP Root Connection

To add a party to a P2MP root connection, use the following procedure.

Step 1 Establish a configuration session using a user name with GROUP1 privileges or higher.

Step 2 Enter the **addparty** command as shown in the following example.

```
mgx8830a.1.PXM.a > addparty <port> <vpi> <vci> <epref> [-party <party_nsap.vpi.vci>]
```

The **addparty** command parameters are described in Table 3-18.

Table 3-18 addparty Command Parameters

Parameter	Description
port	Root endpoint port identifier, in the format [shelf.]slot[:subslot].port[:subport]. To display a list of the available ports using port numbers in the correct format, enter the **dsppnports** command.
vpi	Root endpoint VPI. Enter the VPI specified when the root endpoint was created. To display a list of connections that includes the VPI and VCI for each connection, enter the **dspcons** command.
vci	Root endpoint VCI. Enter the VPI specified when the root endpoint was created. To display a list of connections that includes the VPI and VCI for each connection, enter the **dspcons** command.
epref	Endpoint reference. The range is 1 to 32767.
party	PartyNSAP.vpi.vci To obtain a slave/party's NSAP, see the "Obtaining the NSAP for a Party" section that follows.

The following example adds a party to master endpoint 7:2.11:11, which uses VPI 100 and VCI 100:

```
PXM1E_SJ.8.PXM.a > addparty 7:2.11:11 100 100 1 -party
47009181000000001A533377000001073B0C00.101.101
```

Step 3 To verify that the party was added properly, enter the **dspparty** command as follows:

```
mgx8830a.1.PXM.a > dspparty <port> <vpi> <vci> <epref>
```

The **dspparty** command parameters identify the root endpoint and are the same parameters you specified with the **addparty** command (Table 3-18). The following example shows the **dspparty** command display:

```
XM1E_SJ.8.PXM.a > dspparty 7:2.11:11 100 100 1
Port                   Vpi Vci            Owner      State      Persistency
----------------------------------------------------------------------------
Local  7:2.11:11       100.100            MASTER     OK         Persistent
       Address: 47.00918100000000001a533377.000001073b0b.00
       Node name: PXM1E_SJ
Remote 7:2.12:12       101.101            PARTY      OK         Non-Persistent
       Address: 47.00918100000000001a533377.000001073b0c.00
       Node name: PXM1E_SJ
Endpoint Reference: 1
Last Fail Cause: No Fail                         Attempts: 0
```

Step 4 To view all the configured parties, enter the **dspparties** command as follows:

```
PXM1E_SJ.8.PXM.a > dspparties

Local Port   Vpi.Vci    Epref   Remote Port  Vpi.Vci   State     Owner  Persistency
-------------------------------+-----------------------+---------+------+-------
7:2.11:11    100 100    1       7:2.12:12    101 101     OK        MASTER  Persistent
Local  Addr: 47.00918100000000001a533377.000001073b0b.00
Remote Addr: 47.00918100000000001a533377.000001073b0c.00
```

Step 5 Repeat Steps 4 and 5 to add more parties, one at a time, to the root you created in Step 2.

To display all configured parties for a specific connection, enter the **dsppartiespercon** <*portid*> <*vpi*> <*vci*> command. Replace <*portid*> with the Port identifier whose parties you want to view, in the format. Replace <*vpi*> with the appropriate VPI of the connection, and <*vci*> with the appropriate VCI of the connection.

```
pswpop6.1.PXM.a > dsppartiespercon 5.3 100 100
Port                   Vpi Vci            Owner      State      Persistency
----------------------------------------------------------------------------
5.3          100 100    OK        MASTER  Persistent
Local  Addr: 47.009181000000001029300121.000000050300.00

Remote Party 100 101    OK        PARTY  Persistent
Remote Addr: 47.00918100000000c043002de1.000000050300.00
Endpoint Reference: 101
Remote Party 100 102    OK        PARTY  Persistent
Remote Addr: 47.00918100000000c043002de1.000000050300.00
Endpoint Reference: 102
Port                   Vpi Vci            Owner      State      Persistency
----------------------------------------------------------------------------
5.3          100 100    OK        MASTER  Persistent
Local  Addr: 47.009181000000001029300121.000000050300.00

Remote Party 100 103    OK        PARTY  Persistent
Remote Addr: 47.00918100000000c043002de1.000000050300.00
Endpoint Reference: 103
Remote Party 100 104    OK        PARTY  Persistent
```

Obtaining the NSAP for a Party

The easiest way to obtain the NSAP for a new party is to add a slave endpoint at the port on which the new party will reside. Doing so causes the switch to display an NSAP which identifies the destination port, VPI, and VCI. After you display the NSAP, you must delete it so that the port, VPI, and VCI are available for the new party to use.

Step 1 Establish a configuration session with the switch that will host the party, using a user name with GROUP1 privileges or higher.

Step 2 At the active PXM1E prompt, enter the **addcon** command to establish a slave end-point as described earlier in this chapter in "Configuring the Slave Side of SPVCs and SPVPs."

```
mgx8830a.1.PXM.a > addcon <ifNum> <vpi> <vci> <serviceType> <mastership>
```

In the following example, the user creates a slave on logical port 12 with a VPI of 101, a VCI of 101, and the CBR service type.

```
PXM1E_SJ.8.PXM.a > addcon 12 101 101 1 2
slave endpoint added successfully
slave endpoint id : 4700918100000000001A533377000001073B0C00.101.101
```

Step 3 Write down the NSAP address the switch displays when the **addcon** command is complete. You will need this address when you add the party to the root of the P2MP connection.

Step 4 Enter the **delcon** command to delete the connection you added in Step 2.

Step 5 Enter the **dspcon** command to verify that the slave was deleted properly.

Once you have the NSAP for a party, you can add that party to a root.

Displaying a List of Connections

To display a list of connections on the current PXM1E card, enter the **dspcons** command as follows:

```
PXM1E_SJ.8.PXM.a > dspcons [-port portid] [-vpi starting-vpi] [-vci starting-vci] [-state
{fail|ok|down}]  [-owner {master|slave}] [-sc {cbr | rtvbr | nrtvbr | abr | ubr}]
[-persflag {nonpersistent | persistent}] [-rteid <pref-rte-id> ] [-type {p2p | p2mp}]
[-smconinfo {notavail | avail}]
```

You can enter the **dspcons** command without parameters, or you can include any of the parameters list in Table 3-19.

Table 3-19 Optional Parameters for the dspcons Command

Parameter	Description
portid	Limits the list of connections to all connections on the specified port. Specify the port in the format [shelf.]slot[:subslot].port[:subport]. To display a list of the available ports, enter the **dspcons** command without any options.
starting-vpi	Limits the list of connections to all connections with a VPI equal to or greater than the number you specify.
starting-vci	Limits the list of connections to all connections with a VCI equal to or greater than the number you specify.
-state	Limits the list of connections to all connections that are in the state you specify. State options are **down**, **fail**, and **ok**.
-owner	Limits the list of connections to all connections that use the specified ownership role, which is either **slave** or **master**.
-sc	Service class. This option limits the list of connections to all connections that use the specified service class. Valid service classes are **cbr**, **rtvbr**, **nrtvbr**, **abr**, and **ubr**.
-persflag	Persistence flag. This option limits the list of connections to all connections that match the specified persistence state, which is either **nonpersistent** or **persistent**.
pref-rte-id	Preferred route ID. This option limits the list of connections to all connections that operate on the specified route.
-type	This option limits the list of connections to all connections that match the specified connection type, which is either **p2p** or **p2mp**.
-smconinfo	This option limits the list of connections to all connections that match the specified level of available configuration information, which is either available (**avail)** or not available (**notavail)**.

The following example shows what appears when you enter the **dspcons** command without parameters.

```
PXM1E_SJ.8.PXM.a > dspcons

Local Port   Vpi.Vci    Remote Port  Vpi.Vci     State     Owner  Pri Persistency
----------------------+----------------------+---------+-------+---+-----------
4.1            4 35     Routed        26 35      OK        MASTER 8   Persistent
Local  Addr: 47.00918100000000001a533377.000001072301.00
Remote Addr: 47.009181000000000164444b61.00000107d301.00
Preferred Route ID:-    Cast Type: P2P
4.2            4 36     Routed        26 36      OK        SLAVE  -   Persistent
Local  Addr: 47.00918100000000001a533377.000001072302.00
Remote Addr: 47.009181000000000164444b61.00000107d302.00
Preferred Route ID:-   Cast Type: P2P
11.1          11 119    11.5          11 120     OK        SLAVE  -   Persistent
Local  Addr: 47.00918100000000001a533377.000001075b01.00
Remote Addr: 47.00918100000000001a533377.000001075b05.00
Preferred Route ID:-   Cast Type: P2P
11.5          11 120    11.1          11 119     OK        MASTER 8   Persistent
Local  Addr: 47.00918100000000001a533377.000001075b05.00
Remote Addr: 47.00918100000000001a533377.000001075b01.00
Preferred Route ID:-    Cast Type: P2P
7:2.11:11    100 100    Routed         0 0       OK        MASTER 8   Persistent
Local  Addr: 47.00918100000000001a533377.000001073b0b.00
Remote Addr: 00.000000000000000000000000.000000000000.00
Preferred Route ID:-    Cast Type: P2MP
7:2.11:11    125 125    7:2.12:12    135 135     OK        SLAVE  -   Persistent
Local  Addr: 47.00918100000000001a533377.000001073b0b.00
Remote Addr: 47.00918100000000001a533377.000001073b0c.00
Preferred Route ID:-   Cast Type: P2P
7:2.12:12    135 135    7:2.11:11    125 125     OK        MASTER 8   Persistent
Local  Addr: 47.00918100000000001a533377.000001073b0c.00
Remote Addr: 47.00918100000000001a533377.000001073b0b.00
Preferred Route ID:-    Cast Type: P2P
```

Displaying the Status of a Single Connection

To display the configuration and status of a single connection, enter the **dspcon** command as follows:

```
PXM1E_SJ.8.PXM.a > dspcon <portid> <vpi> <vci>
```

The *portid*, *vpi*, and *vci* parameters uniquely identify the connection you want to display. These parameters can be found for all connections in the **dspcons** command display. The following example shows the data displayed for a single connection.

```
PXM1E_SJ.8.PXM.a > dspcon 7:2.12:12 135 135
Port                   Vpi Vci             Owner      State      Persistency
-----------------------------------------------------------------------------
Local  7:2.12:12       135.135             MASTER     OK         Persistent
       Address: 47.00918100000000001a533377.000001073b0c.00
       Node name: PXM1E_SJ
Remote 7:2.11:11       125.125             SLAVE      OK         Persistent
       Address: 47.00918100000000001a533377.000001073b0b.00
       Node name: PXM1E_SJ
```

```
-------------------- Provisioning Parameters --------------------
Connection Type: VCC          Cast Type: Point-to-Point
Service Category: CBR         Conformance: CBR.1
Bearer Class: BCOB-X
Last Fail Cause: No Fail                          Attempts: 0
Continuity Check: Disabled    Frame Discard: Disabled
L-Utils: 100   R-Utils: 100   Max Cost: -1    Routing Cost: 0 (N/A)
OAM Segment Ep: Enabled
Pref Rte Id: 0                Directed Route: No
Priority: 8                   Num Parties: -

---------- Traffic Parameters ----------
Values: Configured (Signalled)
Tx PCR:  50         (50         )     Rx PCR:  50         (50         )
Tx CDVT: 250000     (250000     )
Tx CDV:  -1         (-1         )     Rx CDV:  -1         (-1         )
Tx CTD:  -1         (-1         )     Rx CTD:  -1         (-1         )

-------------------- Preferred Route Parameters------------------
Currently on preferred route: N/A

-------------------- Others ------------------------------------
SM: Record Number: 2, ATM

-------------------- Soft Reroute Parameters------------------
Negotiated Slave Soft Reroute Capability: DISABLE
Soft Reroute Last Cause: N/A.  Soft Reroute is not performed yet.
```

Notice that the Max Cost, Tx CDV, Rx CDV, Tx CTD, and RxCTD parameters are all set to -1. This means that the connection has not been configured to require specific values for these routing metrics.

Modifying P2P and P2MP Connections

To change the configuration of a P2P or P2MP connection, enter the **cnfcon** command using the following format:

```
PXM1E_SJ.8.PXM.a > cnfcon ifNum vpi vci [-lpcr <cellrate>] [-rpcr <cellrate>]
[-lscr <cellrate>] [-rscr <cellrate>] [-lmbs <cells>] [-rmbs <cells>] [-lcdv <time>]
[-rcdv <time>] [-lctd <time>] [-rctd <time>] [-lmcr <cellrate>] [-rmcr <time>]
[-cdvt <time>] [-cc <1|0>] [-stat <1|0>] [-frame <1|0>] [-mc <maxCost>]
[-segep <oam-segment-endpoint>]
[-lputil <percentage>]  [-rputil <percentage>] [-routingprio <routingpriority>]
[-prefrte <preferredRouteId>] [-directrte <directRoute>]
```

Table 3-17 lists and defines the parameters and options for the **cnfcon** command.

Bringing Down a Connection

Bringing down a connection deroutes a P2P connection or all parties on a P2MP connection. To bring down a connection, enter the **dncon** command using the following format:

```
PXM1E_SJ.8.PXM.a > dncon <portid> <vpi> <vci>
```

Replace the *portid*, *vpi* and *vci* parameters with the values that uniquely identify the connection to be brought down. You can locate these parameters by entering the **dspcons** command. When bringing down a P2MP connection, the **dncon** parameters must identify the root connection endpoint.

Bringing Up a Connection

Bringing up a connection routes a P2P connection or all parties on a P2MP connection. To bring up a connection, enter the **upcon** command using the following format:

```
PXM1E_SJ.8.PXM.a > upcon <portid> <vpi> <vci>
```

Replace the *portid*, *vpi* and *vci* parameters with the values that uniquely identify the connection to be brought up. You can locate these parameters by entering the **dspcons** command. When bringing up a P2MP connection, the **upcon** parameters must identify the root connection endpoint.

Bringing Down a Party

Bringing down a party deroutes a single party on a P2MP connection. To bring down a party, enter the **dnparty** command using the following format:

```
PXM1E_SJ.8.PXM.a > dnparty <portid> <vpi> <vci> <epref>
```

The **dnparty c**ommand parameters are the same parameters you set with the **addparty** command (Table 3-18).

Bringing Up a Party

Bringing up a party reconnects a previously downed party to the P2MP root connection. To bring up a party, enter the **upparty** command using the following format:

```
PXM1E_SJ.8.PXM.a > upparty <portid> <vpi> <vci> <epref>
```

The **upparty c**ommand parameters are the same parameters you set with the **addparty** command (Table 3-18).

Rerouting Connections

Rerouting a connection reroutes a P2MP connection or all parties on a P2MP connection. To reroute a connection, enter the **rrtcon** command using the following format:

```
PXM1E_SJ.8.PXM.a > rrtcon <portid> <vpi> <vci>
```

Replace the *portid*, *vpi* and *vci* parameters with the values that uniquely identify the connection to be rerouted. You can locate these parameters by entering the **dspcons** command. When rerouting a P2MP connection, the **rrtcon** parameters must identify the root connection endpoint.

Rerouting a P2MP Party

The following procedure provides detailed steps for rerouting a party.

Step 1 Establish a configuration session using a user name with GROUP1 privileges or higher.

Step 2 At the active PXM1E prompt, enter the **dspparties** command to display all parties on the node.

```
pswpop6.1.PXM.a > dspparties 5.3 100 100
Port                   Vpi Vci             Owner      State      Persistency
-------------------------------------------------------------------------
5.3          100 100    OK        MASTER  Persistent
Local  Addr: 47.00918100000001029300121.000000050300.00

Remote Party 100 101    OK        PARTY  Persistent
Remote Addr: 47.00918100000000c043002de1.000000050300.00
Endpoint Reference: 10
Remote Party 100 110    OK        PARTY  Persistent
Remote Addr: 47.00918100000000c043002de1.000000050300.00
Endpoint Reference: 11
```

To display information about the specific party you want to modify, enter the **dspparty** command as shown in the following example.

```
pswpop6.1.PXM.a > dspparty <portid> <vpi> <vci> <epref>
```

The **dspparty** command parameters are the same parameters you set with the **addparty** command (Table 3-18).

Step 3 Enter the **rrtparty** command to reroute the appropriate party, as shown in the following example.

```
mgx8830a.1.PXM.a > rrtparty <port> <vpi> <vci> <epref>
```

The **rrtparty c**ommand parameters are the same parameters you set with the **addparty** command (Table 3-18).

Step 4 Enter the **dspparty** command as shown in the following example to verify that the party was rerouted correctly.

```
pswpop6.1.PXM.a > dspparty <portid> <vpi> <vci> <epref>
```

The **dspparty** command parameters are the same parameters you set with the **addparty** command (Table 3-18).

Deleting Connections

To delete a P2P or P2MP connection that terminates on an PXM1E card, enter the **delcon** command using the following format:

```
PXM1E_SJ.8.PXM.a > delcon <portid> <vpi> <vci>
```

Replace the *portid*, *vpi* and *vci* parameters with the values that uniquely identify the connection to be deleted. You can locate these parameters by entering the **dspcons** command. This command deletes the connection end on the local switch. It does not delete the remote end of the connection, which must be deleted on the remote switch.

Note To delete a P2MP connection, you must first delete all parties that use that connection.

Deleting a P2MP Party

Before you can delete a P2MP connection, you must first delete all parties associated with that connection. A P2MP connection will remain in service as long as there are parties configured on that connection. For example, a P2MP connection that has 100 parties will remain in service, even if 99 of those parties are down.

To delete a party from a P2MP connection, enter the **delparty** command, as shown in the following example.

mgx8830a.1.PXM.a > **delparty** *<port> <vpi> <vci> <epref>*

The **delparty** command parameters are the same parameters you set with the **addparty** command (Table 3-18).

Once you have deleted all parties on a P2MP connection, you can delete the connection root by following the procedure in the preceding section.

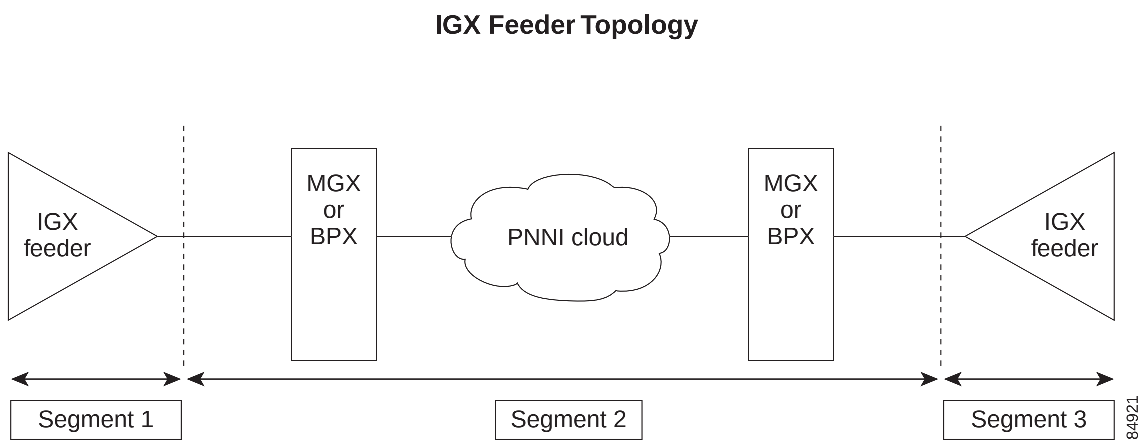
Configuring and Managing a Connection to an IGX Feeder

A Cisco IGX node with a UXM card can be configured as a feeder to a Cisco MGX8850 switch, which can be configured as a routing node for the IGX feeder. The Cisco IGX feeder trunk interface on the UXM can connect to the AXSM, AXSM-E, or PXM1E of a Cisco MGX8850.

Note The procedure that follows applies only to the PXM1E. To configure an IGX feeder connection on an AXSM card, refer to the *Cisco ATM Services (AXSM) Configuration Guide and Command Reference for MGX Switches, Release 5.*

Figure 3-6 shows the IGX feeder topology.

Figure 3-6 IGX Feeder Topology



Connecting a PXM1E Card to a UXM Card on an IGX feeder

This procedure describes how to configure a connection from an MGX 8850 PXM1-E card to an IGX feeder.

Step 1 Establish a configuration session with the Cisco MGX 8850 (PXM1E) or the Cisco MGX 8830 using a user name with GROUP1 privileges or higher.

Step 2 Enter the **upln** command to create an interface between the PXM1E card on the Cisco MGX 8850 or Cisco MGX 8830 switch, and the UXM card on the IGX switch.

Step 3 If you are creating a non-IMA interface, enter the **addport** command. If you are creating an IMA interface, enter the **addimagrp**, **addimalink** and **addimaport** commands, as described in the "Configuring Inverse Multiplexing for ATM" section earlier in this chapter.

Tip Remember that you cannot configure a line until you have brought it up as described in "Bringing Up Lines," which appears earlier in this chapter.

Step 4 At the active PXM1E, enter the **addlmi** <*ifNum*> <*type*> command to designate the interface as a feeder. Replace <*ifNum*> with the logical interface number, in the range from 1 through 60. Replace <*type*> with 1 to specify that the interface you are configuring is a feeder.

Step 5 Enter the **dsppnport** to ensure that the port you are configuring is down. It the port is up, enter the **dnpnport** command to bring it down.

Note The port you are configuring must be down before you specify port signaling.

Step 6 Enter the **cnfpnportsig** <*portid*> **-cntlvc ip** command to define the signaling protocol used on the trunk. Replace <*portid*> using the format *slot*[:*bay*].*line*[:*ifNum*].

Step 7 Enter the **uppnport** <*portid*> command to bring the port up. Replace <*portid*> using the format *slot*:*bay.line*:*ifNum*. Table 3-11 describes these parameters.

Step 8 Establish a configuration session with the Cisco MGX 8850 (PXM1E) or the Cisco MGX 8830 using a user name with GROUP1 privileges or higher.

Step 9 At the UXM switch prompt, enter the **cnfswfunc** command to make the IGX node a feeder.

Step 10 Enter the **uptrk** create a standard trunk or an IMA trunk between the UXM on the IGX and the PXM1E on the Cisco MGX switch.

Step 11 Enter the **cnftrk** configure the trunk.

Note The configuration on the UXM end of the trunk must be identical to the configuration on the PXM1E end of the trunk.

Step 12 Enter the **dsptrk** command to ensure that the trunk you just configured is functioning properly.

Note For more information on the IGX switch and the IGX CLI, refer to the *Cisco IGX 8400 Series Provisioning Guide, Release 9.3.30.*

.

Deleting an IGX Feeder

This procedure describes how to remove an IGX feeder connection from a PXM1E card on a Cisco MGX 8850 (PXM1E) or a Cisco MGX 8830 switch.

Step 1 Establish a configuration session with the Cisco MGX 8850 (PXM1E) or the Cisco MGX 8830 using a user name with GROUP1 privileges or higher.

Step 2 At the active PXM1E, enter the **delcon** or **delcons** command to delete all connections to the IGX feeder.

> **Note** If you use the **delcon** command, you must enter the command once for each connection to the IGX feeder.

Step 3 Enter the **dellmi** <*ifNum*> command to delete the LMI from the feeder interface. Replace <*ifNum*> with the number assigned to the port.

> **Note** Remove all connections before you delete LMI on an interface.

Step 4 Establish a configuration session with the Cisco IGX 8400 switch using a user name with GROUP1 privileges or higher.

Step 5 At the UXM card, enter the **cnftrk** command to set the UXM trunk configuration so that it does to not listen for LMI/AAL5 messages.

Step 6 Enter the **dntrk** command to down the UXM interface.

Step 7 Enter the **cnfswfunc** to turn off the feeder functionality on the IGX switch. For more information on the IGX switch and the IGX CLI, refer to the *Cisco IGX 8400 Series Provisioning Guide, Release 9.3.30*.

> **Note** For more information on the IGX switch and the IGX CLI, refer to the *Cisco IGX 8400 Series Provisioning Guide, Release 9.3.30*.

CHAPTER 4

Preparing Service Modules for Communication

This chapter describes how to prepare service modules for operation in an MGX switch. All MGX switch cards except PXM, SRM, XM-60, and RPM are service modules. Service modules add ATM, circuit emulation and Frame Relay services to a switch. Table 1-2 in Chapter 1, "Preparing for Configuration," lists service module services and the service modules that provide them. This table also lists the interfaces supported on the service modules.

Tip For information on which slots support each type of service module, see Table 2-9 in Chapter 2, "Configuring General Switch Features." For information on the redundancy options for each service module, refer to the *Cisco MGX 8850 (PXM1E/PXM45), Cisco MGX 8950, Cisco MGX 8830, and Cisco MGX 8880 Hardware Installation Guide, Releases 2 Through 5*.

The procedures in this chapter help you complete the initial configuration required for each service module. After the initial configuration is complete, the card is ready for provisioning. Provisioning is described in the configuration and command reference guide for each service module. Table 1-1 in Chapter 1, "Preparing for Configuration," lists the service module configuration and command reference guides.

The following sections provide a quickstart procedure for configuring service modules and describe the following procedures:

- Managing Firmware Version Levels for Service Modules
- Establishing Redundancy Between Two Service Modules
- Selecting a Card SCT
- Selecting a Port SCT

Note The *Cisco MGX 8850 (PXM1E/PXM45), Cisco MGX 8950, Cisco MGX 8830, and Cisco MGX 8880 Hardware Installation Guide, Releases 2 Through 5*, describes the physical planning requirements for installing redundant service modules with standalone or redundant lines. If these requirements are not met, the planned service module configuration will not work properly.

Note For the purposes of this document, the term "AXSM" refers to all types of AXSM cards. In this document, the term AXSM/A distinguishes the first release of AXSM from AXSM/B, AXSME, and AXSM-XG cards.

Configuration Quickstart

The quickstart procedure in this section provides a summary of the tasks required to prepare service modules for operation in an MGX switch. This procedure is provided as an overview and as a quick reference for those who already have configured Cisco MGX switches.

	Command	Purpose
Step 1	*username* *<password>*	Start a configuration session. **Note** To perform all the procedures in this quickstart procedure, you must log in as a user with GROUP1 privileges or higher.
Step 2	**setrev** *<slot> <version>* Related commands: **dspcds**	Initialize service modules by setting the firmware version level for each one. See the "Managing Firmware Version Levels for Service Modules" section, which appears later in this chapter.
Step 3	**cnfcdmode** *<slot> <interfaceType> <service>* Related commands: **dspcd** **dspcds**	If you are configuring an MPSM card, select the back card interface type (T1, E1, T3 or E3). If you are configuring a MPSM-8-T1E1, you must also select the service (ATM, Frame Relay, or circuit emulation) this card will support. **Note** This step is required only for MPSM cards. See the "Selecting MPSM Interfaces and Services" section later in this chapter.
Step 4	**movelic** *<options>*	If you are configuring an MPSM card and that card has feature licenses installed on it, use the **movelic** command to transfer the licenses to the license pool for the switch. **Note** This step is required only for MPSM cards. See Appendix F, "MPSM Licensing"
Step 5	**addred** *<options>*	Define which service modules are operating as redundant cards. See the "Establishing Redundancy Between Two Service Modules" section, which appears later in this chapter.
Step 6	**cnfcdsct** *<sctid>* Related commands: **dspcd**	This optional step applies only to AXSM, FRSM12, and MPSM-T3E3-155 cards and applies communications parameters from a preconfigured Service Class Template (SCT) file to all communications between the service module you are configuring and the other service modules in the switch. See the "Selecting a Card SCT" section, which appears later in this chapter.

Managing Firmware Version Levels for Service Modules

The service modules within the switch run two types of firmware: boot firmware and runtime firmware. The boot firmware provides the startup information the card needs. The boot firmware is installed on the board at the factory. The runtime firmware controls the operation of the card after startup. The runtime firmware file is stored on the PXM hard disk.

After service modules are installed in the switch, you must specify the correct runtime firmware version for each card before the switch can begin using the card. The following sections explain how to

- Locate the cards that need to have the firmware version level set
- Set the firmware version levels for cards in the switch
- Verify the firmware version levels being used by cards

Locating Cards that Need the Firmware Version Set

When a service module is installed and the firmware version needs to be set, the System Status LED on the front of the card blinks red. The **dspcds** command shows that the card status is Failed. Other events can display these symptoms, but if the service module is new, the problem is probably that the firmware version number has not been set. To locate the cards that need to have the firmware version set, use the following procedure.

Step 1 Establish a CLI management session at any access level.

Step 2 To display a list of all the cards in the switch, enter the **dspcds** command.

```
8850_NY.7.PXM.a > dspcds
```

The following example shows the display for this command. The card state for the card in slot 3 is listed as Failed/Active. This is how a card appears when the runtime firmware version has not been selected.

```
M8850_LA.7.PXM.a > dspcds
M8850_LA                         System Rev: 02.01   Sep. 27, 2001 20:33:09 PST
Chassis Serial No:   SAA03230375 Chassis Rev: B0     GMT Offset: -8
                                                     Node Alarm: NONE
Card  Front/Back          Card           Alarm      Redundant   Redundancy
Slot  Card State          Type           Status     Slot        Type
---   ----------          --------       --------   -------     -----

01    Active/Active       AXSM_4OC12     NONE       NA          NO REDUNDANCY
02    Empty               ---            ---        ---         ---
03    Failed/Active       AXSM_16T3E3    NONE       NA          NO REDUNDANCY
04    Empty               ---            ---        ---         ---
05    Active/Active       AXSME_2OC12    NONE       NA          NO REDUNDANCY
06    Active/Active       AXSM_16OC3_B   NONE       NA          NO REDUNDANCY
07    Active/Active       PXM45          NONE       08          PRIMARY SLOT
08    Standby/Active      PXM45          NONE       07          SECONDARY SLOT
09    Active/Active       RPM_PR         NONE       NA          NO REDUNDANCY
10    Empty               ---            ---        ---         ---
11    Empty               ---            ---        ---         ---
12    Empty Reserved             ---           ---        ---         ---
13    Empty Reserved             ---           ---        ---         ---
14    Empty               ---            ---        ---         ---
```

Note the slot number, card type, and redundancy type for each card that needs to have the firmware version set. You will need this information to activate these cards as described in the next section, “Initializing Service Modules.”

Note If any service module displays the Active/Active card state, you do not have to set the runtime firmware version for that card.

Initializing Service Modules

Before a service module can operate, it must be initialized in a switch slot. The initialization process defines the runtime software version that will run on the card and identifies the slot in which the card operates. To initialize a service module, use the following procedure.

Note The line count for all cards in the switch must not exceed the maximum number of lines supported by the current PXM. The PXM45/A supports 192 UNI/NNI lines. The PXM45/B and PXM45/C support up to 4,000 UNI/NNI interfaces. Keep this information in mind as you add service modules to your switch.

Step 1 If you have not already done so, determine the software version number for the card by referring to the following release note documents:

- *Release Notes for Cisco MGX 8850 (PXM1E/PXM45), Cisco MGX 8950, and Cisco MGX 8830 Switches, Release 5.0.00*
- *Release Notes for the Cisco MGX 8880 Media Gateway, Release 5.0.00*

Tip If you have trouble locating the runtime firmware version level, use the filenames on the PXM hard disk to determine the level. For more information, see the "Determining the Software Version Number from Filenames" section in Chapter 9, "Switch Operating Procedures."

Step 2 Establish a configuration session using a user name with SERVICE_GP privileges or higher.

Step 3 To set the firmware revision level for a card, enter the **setrev** command.

```
mgx8850a.7.PXM.a > setrev <slot> <version>
```

Note Each card should be initialized only once with the **setrev** command. The only other time you should enter the **setrev** command is to initialize cards after the configuration has been cleared with the **clrallcnf** command.

Replace <*slot*> with the card slot number and replace <*version*> with the software version number. For example,

```
mgx8850a.7.PXM.a > setrev 1 2.1(60)
```

After you enter the **setrev** command, the System status LED blinks red until the firmware load is complete, and then it changes to non-blinking green.

Step 4 To verify the activation of a card for which the status was previously listed as Failed/Empty, enter the **dspcds** command. The status should appear as follows:

- All service modules except MPSM should display Active/Active.
- MPSM cards should display Standby/Empty.

To bring MPSM cards up to the Active/Active status, you must configure an interface type. For MPSM-8-T1E1 cards, you must also configure a service. For more information, see the “Selecting MPSM Interfaces and Services” section, which appears later in this chapter.

Verifying Card Firmware Version Levels

When you are having problems with your switch, or when you have taken delivery of a new switch but delayed installation, it is wise to verify the firmware versions installed on the switch. If newer versions of this firmware are available, installing the updated firmware can prevent switch problems.

To verify the firmware versions in use on your switch, use the following procedure.

Step 1 To display the software revision status of all the cards in a switch, enter the **dsprevs** command as follows:

```
M8850_LA.7.PXM.a > dsprevs
M8850_LA                         System Rev: 02.01   Sep. 27, 2001 20:36:15 PST
MGX8850                                              Node Alarm: NONE
Physical  Logical   Inserted       Cur Sw              Boot FW
Slot      Slot      Card           Revision            Revision
--------  -------   --------       --------            --------

01        01        AXSM_4OC12     2.1(60)             2.1(60)
02        02        ---            ---                 ---
03        03        AXSM_16T3E3    2.1(60)             2.1(60)
04        04        ---            ---                 ---
05        05        AXSME_2OC12    2.1(60)             2.1(60)
06        06        AXSM_16OC3_B   2.1(60)             2.1(60)
07        07        PXM45          2.1(60)             2.1(60)
08        07        PXM45          2.1(60)             2.1(60)
09        09        RPM_PR         ---                 ---
10        10        ---            ---                 ---
11        11        ---            ---                 ---
12        12        ---            ---                 ---
13        13        ---            ---                 ---
14        14        ---            ---                 ---
```

Step 2 To see the software revision levels for a single card, enter the **dspversion** command as follows:

```
8850_NY.1.AXSM.a > dspversion

  Image Type   Shelf Type    Card Type         Version   Built On
  ----------   ----------   ----------    ------------   ------------
     Runtime          MGX         AXSM     2.1(0)        Feb 13 2001, 07:47:35
        Boot          MGX         AXSM     2.1(0)        -
```

Step 3 Another way to see the software revision levels for a single card is to enter the **dspcd** command as follows:

```
M8850_LA.7.PXM.a > dspcd 1
M8850_LA                         System Rev: 02.01   Sep. 27, 2001 20:38:48 PST
MGX8850                                              Node Alarm: NONE
Slot Number:   1    Redundant Slot: NONE

                    Front Card          Upper Card          Lower Card
                    ----------          ----------          ----------

Inserted Card:      AXSM_4OC12          SMFIR_2_OC12        SMFIR_2_OC12
Reserved Card:      AXSM_4OC12          SMFIR_2_OC12        SMFIR_2_OC12
State:              Active              Active              Active
Serial Number:      SAK0350007N         SAK0346003F         SBK0406001V
Prim SW Rev:        2.1(60)             ---                 ---
Sec SW Rev:         2.1(60)             ---                 ---
Cur SW Rev:         2.1(60)             ---                 ---
Boot FW Rev:        2.1(60)             ---                 ---
800-level Rev:
800-level Part#:    800-05774-05        800-05383-01        800-05383-01
CLEI Code:          BAA1BADAAA          0000000000          BAI9ADTAAA
Reset Reason:       On Power up
Card Alarm:         NONE
Failed Reason:      None
Miscellaneous Information:

Type <CR> to continue, Q<CR> to stop:
```

Step 4 Using the **dsprevs** and **dspcd** commands, complete the hardware and software configuration worksheet in Table E-6.

Step 5 Compare the versions you noted in Table E-6 with the latest versions listed in the release note documents:

- *Release Notes for Cisco MGX 8850 (PXM1E/PXM45), Cisco MGX 8950, and Cisco MGX 8830 Switches, Release 5.0.00*
- *Release Notes for the Cisco MGX 8880 Media Gateway, Release 5.0.00*

Step 6 If the switch requires software updates, upgrade the software using the instructions in Appendix A, “Downloading and Installing Software Upgrades.”

Selecting MPSM Interfaces and Services

After you initialize an MPSM card, the status changes from Failed/Empty to Standby/Empty. MPSM cards are designed to support multiple interface types (T1, E1, T3, and E3) and multiple services (ATM, Frame Relay, and circuit emulation). To bring an MPSM-8-T1E1 card to the Active/Active state, you must specify the interface type and service to be used. To bring an MPSM-T3E3-155 card to the

Active/Active state, you must specify only the interface type because this card can simultaneously support ATM and Frame Relay services on different ports. To configure MPSM interfaces and services, use the **cnfcdmode** command as described in the following procedure.

Step 1 Establish a configuration session using a user name with SERVICE_GP privileges or higher.

Step 2 Enter the cnfcdmode command using the following format:

```
M8850_SF.7.PXM.a > cnfcdmode <slot> <interfaceType> <service>
```

Table 4-1 defines the parameters for this command. After you enter the **cnfcdmode** command, the card resets and the status changes to Active/Active.

Table 4-1 cnfcdmode Command Parameters

Parameter	Description
slot	Enter the number for the slot in which the MPSM card is installed.
interfaceType	Enter a number from the following list that selects the interface type to be used with the MPSM: • T1 Interface = 1 • E1 Interface = 2 • T3 Interface = 3 • E3 Interface = 4
service	Enter a number from the following list that selects the service the MPSM will support: • Frame Relay Service = 1 • ATM Service = 2 • CES Service = 3 **Note** This parameter applies only to MPSM-8-T1E1 cards.

The following example shows how to configure an MPSM-8-T1E1 card to use a T1 interface and Frame Relay services:

```
M8850_SF.7.PXM.a > cnfcdmode 28 1 1
You are about to configure MPSM in slot 28 to :
Service Type : Frame Interface Type : T1
Unknown line module back card present
cnfcdmode: Do you want to proceed (Yes/No)? y
```

After you set the interface type and service, the card resets. You can check the status with the **dspcd** <*slot*> command. You can verify that the **cnfcdmode** command has been run by looking at the *Inserted Card* row of the **dspcd** display. Before MPSM-8-T1E1 configuration, the *Inserted Card* row displays the generic name *MPSM-8T1E1*. After configuration, the generic name changes to a specific name such as MPSM-8T1-FRM. Table 4-2 lists the card names and what they mean when they appear in the **dspcd** and **dspcds** command displays. While the card is resetting, the status will be *Empty Resvd*. When the reset is complete and the card is ready for provisioning, the status changes to Active.

Table 4-2 MPSM-8-T1E1 Card Names in the dspcd and dspcds Command Displays

Card Name	Description
MPSM-8T1E1	No service configured on card.
MPSM-8E1-ATM	Configured for ATM services and E1 interfaces.
MPSM-8E1-CES	Configured for circuit emulation services and E1 interfaces.
MPSM-8E1-FRM	Configured for Frame Relay services and E1 interfaces.
MPSM-8T1-ATM	Configured for ATM services and T1 interfaces.
MPSM-8T1-CES	Configured for circuit emulation services and T1 interfaces.
MPSM-8T1-FRM	Configured for Frame Relay services and T1 interfaces.

Establishing Redundancy Between Two Service Modules

Guidelines for configuring redundancy between two service modules are provided in the *Cisco MGX 8850 (PXM1E/PXM45), Cisco MGX 8950, Cisco MGX 8830, and Cisco MGX 8880 Hardware Installation Guide, Releases 2 Through 5*. To establish redundancy between two service modules, use the following procedure.

Step 1 Establish a configuration session using a user name with SUPER_GP privileges or higher.

Step 2 If you have not done so already, set the firmware version for both cards, as described in the “Initializing Service Modules” section.

Step 3 Enter the **dspcds** command to verify that both service modules are in the Active state.

Step 4 Enter the **addred** command as follows:

```
pop20one.7.PXM.a > addred <redPrimarySlotNum> <redSecondarySlotNum> <redType>
```

Replace *<redPrimarySlotNum>* with the slot number of the service module that will be the primary card, and replace *<redSecondarySlotNum>* with the slot number of the secondary service module.

Replace *<redType>* with the number **1** to select 1:1 card redundancy (also called Y-cable redundancy), or enter **2** to select 1:N redundancy. Each service module type supports only one redundancy type, and the redundancy types are defined in the *Cisco MGX 8850 (PXM1E/PXM45), Cisco MGX 8950, Cisco MGX 8830, and Cisco MGX 8880 Hardware Installation Guide, Releases 2 Through 5*.

Note One of the two cards can be configured before redundancy is established. If this is the case, the configured card should be specified as the primary card. Redundancy cannot be established if the secondary card has active lines. If the secondary card has active lines, you must delete all ports and down all lines before it can be specified as a secondary card.

Tip If the switch displays the message, `ERR: Secondary cd is already reserved`, then lines are already in use on the specified secondary card. Enter the **dnln** command to bring down these lines before re-entering the **addred** command.

Note When MPSM cards are installed on the switch, the **addred** command will fail if there are not enough licenses on the secondary card (1:N redundant configurations) or in the license pool to match the licenses already in use on the primary card. For example, if the primary card is configured to use the ABR rate control feature, and if the configuration of other primary cards has not already added a ABR rate control license to the secondary card, the secondary card will require an ABR rate control license from the license pool. If no license is available, the **addred** command fails.

Step 5 To verify that the redundancy relationship is established, enter the **dspred** command as shown in the following example:

```
pop20two.7.PXM.a > dspred
pop20two                         System Rev: 02.01   Feb. 06, 2001 11:24:53 PST
MGX8850                                              Node Alarm: NONE
Primary  Primary   Primary    Secondary  Secondary  Secondary    Redundancy
SlotNum   Type      State      SlotNum     Type       State         Type
-------  -------  ---------   ---------  ---------  ---------    ----------
  1      AXSM      Active        2        AXSM       Standby        1-1

  7      PXM45     Active        8        PXM45      Standby        1-1

  15     SRM-3T3   Empty Res     16       SRM-3T3    Empty Resvd    1-1

  31     SRM-3T3   Empty Res     32       SRM-3T3    Empty Resvd    1-1
```

The secondary state for the card in the secondary slot changes to *Standby* only when the secondary card is ready to take over as active card. After you enter the **addred** command, the switch resets the secondary card. When you first view the redundancy status, the state may be *Empty Resvd* or *Init*. The secondary card may require one or two minutes to transition to standby.

Note The **dspcds** command also shows the redundancy relationship between two cards.

For information on managing redundant cards, see the "Managing Redundant Cards" section in Chapter 9, "Switch Operating Procedures."

Selecting a Card SCT

A Service Class Template (SCT) is a configuration file that defines the traffic characteristics of the various class of service queues in AXSM and FRSM12 service modules. The same card SCT may be used for multiple cards of the same card type.

Note An SCT must be registered before you can select it for a card or port. For instructions on registering SCTs, see "Registering SCT Files" in Chapter 7, "Managing Service Class Templates."

To select an SCT for a card, use the following procedure.

Step 1 Establish a configuration session using a user name with GROUP1 privileges or higher.

Step 2 Enter the **cc** command to change to an active service module for which you will select an SCT.

```
M8850_LA.8.PXM.a > cc 1

(session redirected)

M8850_LA.2.AXSM.a >
```

Note In a redundant pair, you must specify the SCT on the active card.

Step 3 All ports on the card must be down before you can configure the card SCT. To verify the status of the ports on the card, enter the **dspports** command.

```
M8850_LA.2.AXSM.a > dspports
ifNum Line Admin Oper. Guaranteed Maximum   SCT Id ifType  VPI   minVPI maxVPI
           State State Rate       Rate     (D:dflt        (VNNI, (EVNNI,EVUNI)
                                            used)          VUNI)
----- ---- ----- ----- ---------- --------- ------ ------ ------ ------ ------
    1  2.1    Up  Down    1412830   1412830   5       NNI      0      0      0
    2  2.2    Up  Down    1412830   1412830   5       NNI      0      0      0
    3  1.1    Up    Up    1412830   1412830   5       NNI      0      0      0
```

Enter the **dnport** command to bring down any ports that are in the Admin State “Up”.

```
M8850_LA.2.AXSM.a > dnport 2
dnport/dnallports can disrupt traffic on existing connections.
Use this command only to modify partition parameters or change SCT
Do you want to proceed (Yes/No) ? y
```

Step 4 Enter the **cnfcdsct** command.

```
pop20two.1.AXSM.a > cnfcdsct <sctID>
```

Replace *sctID* with the number of the SCT that you want to assign to the card. Table 7-1 in Chapter 7, “Managing Service Class Templates,”describes the SCTID options.

Note When a service module is powered up for the first time, the default card SCT file is used. You must run the **cnfcdsct** command in order to use another SCT file. The default SCT file s 0.

Step 5 To display the SCT assigned to a card, enter the following command:

```
pop20two.1.AXSM.a > dspcd
```

The display card report displays a row labeled “Card SCT Id,” which identifies the SCT assigned to the card.

```
M8850_LA.1.AXSM.a > dspcd
                    Front Card          Upper Card          Lower Card
                    ----------          ----------        ------------

Card Type:          AXSM-4-622          SMFIR-2-622         SMFIR-2-622
State:              Active              Present             Present
Serial Number:      SAK0350007N         SAK0346003F         SBK043902FE
Boot FW Rev:        3.0(0.171)P2        ---                 ---
SW Rev:             3.0(0.171)P2        ---                 ---
800-level Rev:      09                  13                  A1
Orderable Part#:    800-5774-5          800-5383-1          800-5383-1
PCA Part#:          73-4504-2           73-4125-1           73-4125-1
CLEI Code:          BAA1BADAAA          0000000000          BAI9ADTAAA
Reset Reason:       Power ON Reset

Card Operating Mode: AXSM-A

SCT File Configured Version: 1

SCT File Operational Version: 1

Card SCT Id: 5


Type <CR> to continue, Q<CR> to stop:
```

Step 6 Enter the **upport** <*if*> command to bring up any ports you brought down in Step 3. Replace <*if*> with the interface number of the downed port.

```
M8850_LA.1.AXSM.a > upport 1
```

Step 7 Enter the **dspports** command to verify that all ports on the card are up.

```
M8850_LA.1.AXSM.a > dspports
ifNum Line Admin Oper. Guaranteed Maximum   SCT Id ifType  VPI   minVPI maxVPI
           State State Rate       Rate     (D:dflt        (VNNI, (EVNNI,EVUNI)
                                            used)          VUNI)
----- ---- ----- ----- ---------- --------- ------ ------ ------ ------ ------
    1  2.1    Up    Up    1412830   1412830   5       NNI      0      0      0
    2  2.2    Up    Up    1412830   1412830   5       NNI      0      0      0
    3  1.1    Up    Up    1412830   1412830   5       NNI      0      0      0
```

Selecting a Port SCT

A port SCT defines queue parameters that apply to egress queues on a port. Port SCTs are configured when provisioning ports. For more information on provisioning service module ports and configuring port SCTs, refer to the configuration and command reference guide for the service module. These guides are listed in Table 1-1 in Chapter 1, “Preparing for Configuration.”

CHAPTER 5

Preparing SRM Cards for Communications

To prepare SRM cards for communication, you need to know which SRM features will be used. Because SRM cards operate as extensions of the PXM cards, they are initialized when you initialize the PXM card, so the initialization procedure required for most service modules is not required for SRM. SRM cards provide the following features:

- 1:N redundancy support for select service modules
- Bulk distribution
- Bit error rate testing (BERT)

Note For more information on BERT, see the Managing Bit Error Rate Tests section of Chapter 9, "Switch Operating Procedures."

SRM cards can operate as standalone cards or as redundant cards. As described in the *Cisco MGX 8850 (PXM1E/PXM45), Cisco MGX 8950, Cisco MGX 8830, and Cisco MGX 8880 Hardware Installation Guide, Releases 2 Through 5*, MGX switches are preconfigured for SRM card redundancy, and this redundancy must match the configuration (standalone or redundant) of the PXM card. After installation, no configuration is required to establish a standalone or redundant SRM configuration.

When installed, SRM cards automatically support 1:N redundancy for 8-port service modules with T1 or E1 interfaces as listed in the *Cisco MGX 8850 (PXM1E/PXM45), Cisco MGX 8950, Cisco MGX 8830, and Cisco MGX 8880 Hardware Installation Guide, Releases 2 Through 5*. To configure 1:N redundancy for service modules, refer to Chapter 4, "Preparing Service Modules for Communication."

Tip If you are not using the SRM bulk distribution feature, you can skip reading the rest of this chapter, which describes how to configure bulk distribution on SRM cards.

The bulk distribution feature enables the SRM to receive T1 and E1 traffic that has been multiplexed into a T3 or OC-3 line and route that traffic to the appropriate service module for processing. Responses are sent back through the SRM to the equipment at the other end of the T3 or OC-3 line.

When bulk distribution is used, you must bring up and optionally configure the T3 or OC-3 lines on SRM back cards. For redundant SRM cards with SONET/SDH interfaces, you have the option of configuring line redundancy for the attached OC-3 lines. For all cards that use bulk distribution services, you must configure *links*, which are logical mappings between the lines on the service modules and the channels embedded in the T3 or OC-3 lines connected to a SRM.

When planning for bulk distribution, consider the following guidelines:

- Bulk distribution works with T1 and E1 service modules. Refer to the *Cisco MGX 8850 (PXM1E/PXM45), Cisco MGX 8950, Cisco MGX 8830, and Cisco MGX 8880 Hardware Installation Guide, Releases 2 Through 5*, to see which service modules support bulk distribution.
- The *Cisco MGX 8850 (PXM1E/PXM45), Cisco MGX 8950, Cisco MGX 8830, and Cisco MGX 8880 Hardware Installation Guide, Releases 2 Through 5*, describes the physical planning requirements for installing hardware to support bulk distribution. If these requirements are not met, bulk distribution will not work properly.
- When a service module is configured to use bulk distribution, this service is applied to all lines on the service module and no back cards are required.
- A standalone or redundant SRM-3T3/C configuration can support up to 80 T1 channels, each of which supports a service module T1 port. These channels can be divided between up to 10 card slots per bay.
- A standalone or redundant SRME/B with a BNC-3T3-M back card can support up to 84 T1 channels, each of which supports a service module T1 port. These channels can be divided between up to 11 card slots per bay.
- The maximum number of E1 channels is 63, each of which supports a service module E1 port. These channels can be divided between up to 8 card slots per bay.
- A standalone or redundant SRME or SRME/B SONET/SDH configuration can support up to 84 T1 channels or 63 E1 channels per bay, and these channels can be divided between all 12 card slots in the bay.

This chapter provides quickstart procedures for configuring SRM cards, and it provides the following additional procedures that describe the steps in the quickstart procedures:

- Setting Up SRM Lines
- Establishing Redundancy Between SONET/SDH Lines with APS
- Linking Service Module Lines to SRM Channels, VTs, or VCs

Note SRM configuration is done from the PXM card. The software does not allow you to use the **cc** command switch to an SRM.

Note The Cisco MGX 8950 does not support SRM cards.

Configuration Quickstart for Bulk Distribution on SRMs Configured for SONET/SDH

The quickstart procedure in this section summarizes how to configure bulk distribution on SRME and on SRME/B cards configured for SONET/SDH interfaces. This procedure is a quick reference for those who already have configured Cisco MGX 8850 (PXM1E/PXM45) and Cisco MGX 8830 switches.

	Command	Purpose
Step 1	*username* <*password*>	Start a configuration session. **Note** To perform all the procedures in this quickstart procedure, you must log in as a user with GROUP1 privileges or higher.
Step 2	**upln** <*bay.line*> Related commands: **dsplns** **dspln** -*type* <*bay.line*>	At the active PXM prompt, bring up and activate the SONET/SDH line. This step establishes physical layer connectivity between the SRM and the CPE. See the "Setting Up SRM Lines" section later in this chapter.
Step 3	**cnfln** <*options*> Related commands: **dsplns** **dspln** -*type* <*bay.line*>	At the active PXM prompt, configure the SONET/SDH line if you need to change the default values. See the "Configuring a SONET/SDH Line" section later in this chapter.
Step 4	**addapsln** <*workingIndex*> <*protectIndex*> <*archmode*>	If you want to provide line redundancy for a SONET/SDH line, configure APS. See the "Establishing Redundancy Between SONET/SDH Lines with APS" section later in this chapter.
Step 5	**addlink**	Map service module lines to the SRM channels they will use. See the "Linking Service Module Lines to SRM Channels, VTs, or VCs" section later in this chapter.

Configuration Quickstart for Bulk Distribution on SRMs Configured for T3 Interfaces

The quickstart procedure in this section describes how to configure bulk distribution on SRM-3T3C cards and on SRME/B cards with T3 interfaces. This procedure is a quick reference for those who already have configured Cisco MGX 8850 (PXM1E/PXM45) and Cisco MGX 8830 switches.

	Command	Purpose
Step 1	*username* <*password*>	Start a configuration session. **Note** To perform all the procedures in this quickstart procedure, you must log in as a user with GROUP1 privileges or higher.
Step 2	**upln** <*bay.line*> Related commands: **dsplns** **dspln** -*type* <*bay.line*>	At the active PXM prompt, bring up and activate the lines on the SRM card. This step establishes physical layer connectivity between the SRM and the CPE. See the "Setting Up SRM Lines" section later in this chapter.
Step 3	**cnfln** <*options*> Related commands: **dsplns** **dspln** -*type* <*bay.line*>	At the active PXM prompt, configure the T3 lines if you want to change the default values. See the "Configuring T3 Lines" section later in this chapter.
Step 4	**addlink**	Map service module lines to the SRM channels they will use. See the "Linking Service Module Lines to SRM Channels, VTs, or VCs" section later in this chapter.

Setting Up SRM Lines

The first step in configuring SRM lines is to define the physical lines that are connected to the switch. The following sections describe how to do the following procedures:

- Bring up lines
- Configure lines
- Verify the configuration of lines

Bringing Up Lines

Before a line is brought up, or after it is brought down, the switch does not monitor the line. The SRM port status light for the line is unlit, and all line alarms are cleared.

When you bring up a line, the switch starts monitoring the line. The SRM line status light is green when physical layer communication is established with a switch or CPE. If physical layer communications problems are detected, the port status light turns red, and alarms are reported.

Tip To minimize the number of alarms and failed port status lamps (which display red), keep lines down until they are ready for operation.

To bring up a line on the SRM, use the following procedure.

Step 1 Establish a configuration session on the PXM card using a user name with GROUP1 privileges or higher.

Step 2 Enter the **upln** command at the switch prompt.

```
mgx8830b.1.PXM.a > upln <X.line>
```

Replace <*X*> with the logical slot number of the SRM. On a Cisco MGX 8850 (PXM1E/PXM45), replace <*X*> with 15 if the line is connected to a back card in the upper bay, or replace it with 31 if the line is connected to a back card in the lower bay. On a Cisco MGX 8830, replace <*X*> with 7.

Replace <*line*> with the line number you want to bring up. For example:

```
PXM1E_SJ.8.PXM.a > upln 31.1
```

Step 3 Enter the **dsplns** <*logical slot*> command to verify that the appropriate line is up and to display all available lines on an SRM. Replace *logical slot* with the slot number of the SRM for which you are displaying lines.

The Line State column shows whether a line is up or down as shown in the following example:

```
PXM1E_SJ.8.PXM.a > dsplns 31
                                   Medium   Medium           VT
Sonet         Line     Line   Line Frame    Line   VT        Maping APS
Line          State    Type   Lpbk Scramble Type   Type      Type   Enabled
------------- ----- --------- ---- -------- ------ --------- ------ -------
 31.1            Up sonetSts3 NoLo   Enable ShortS vt15/vc11 asynch Disabl
```

The line state, which is either Up or Down, represents the administrative intent for the line. For example, a line is reported as Down until you bring it up. Once you bring up the line, the line state remains Up until you bring it down with the **dnln** command.

The alarm state indicates whether the line is communicating with another device. When the alarm state is Clear, the devices at each end of the line have established physical layer communications. ATM connectivity is later established when logical interfaces are configured on the line.

Configuring Lines on an SRM Card

All line types are brought up with a default configuration. If the default configuration matches the CPE to which SRM will connect, no configuration is required. The following sections describe how to display the configuration for SONET/SDH and T3 lines, and how to configure these lines when changes are required.

Configuring a SONET/SDH Line

The following procedure describes how to view a SONET/SDH line configuration, and how to configure the line on an SRME or SRME/B card.

Step 1 Establish a configuration session using a user name with GROUP1 privileges or higher.

Step 2 To display the current configuration of an SRME line, enter the **dspln** command as follows:

```
PXM1E_SJ.8.PXM.a > dspln -sonet X.1
```

If you are configuring a Cisco MGX 8850 (PXM1E/PXM45) switch, replace *X* with 15 for an SRME in the upper bay, or 31 for an SRME in the lower bay. If you are configuring a Cisco MGX 8830 switch, replace *X* with 7. SRME provides one line, so the line number is always one as shown in the following example:

```
PXM1E_SJ.8.PXM.a > dspln -sonet 31.1
  Line Number             : 31.1
  Admin Status            : Up
  Loopback                : NoLoop            APS enabled         : Disable
  Frame Scrambling        : Enable            RDI-V Type          : one bit
  Xmt Clock source        : localTiming       RDI-P Type          : one bit
  Line Type               : sonetSts3         VT Type             : vt15/vc11
  Medium Type(SONET/SDH)  : SONET             VT Mapping Type     : asynchronous
  Medium Time Elapsed     : 508               VT Framing Type     : N/A
  Medium Valid Intervals  : 0                 VT Signalling Mode  : N/A
  Medium Line Type        : ShortSMF          VT Grouping Type    : N/A
```

Step 3 To configure a SONET or SDH line, enter the **cnfln** command as follows:

```
mgx8830b.1.PXM.a > cnfln -sonet <X.1> -slt <LineType> -clk <clockSource> -lpb <loopback>
-sfs <FrameScramble> -rdiv <RDI-V Type> -rdip <RDI-P Type> -tt <Tributary Type> -tm
<TributaryMappingType> -tf <TributaryFramingType> -st <SignallingTranportMode> -tg
<TributaryGroupingType>
```

Remember that you cannot configure a line until you have brought it up as described in the previous section, "Bringing Up Lines." Table 5-1 lists the parameter descriptions for configuring SONET and SDH lines.

Table 5-1 Parameters for SONET Line Configuration

Parameter	Description
X.1	Replace *X* with **15** if you are configuring an SRM in the upper bay, or replace it with **31** if you are configuring an SRM in the lower bay. The number 1 represents the one and only line on an SRME card.
-slt	Optical line type. Replace < *LineType*> with 1, to specify SONET, or replace < *LineType*> with 2 to specify SDH.
-clk	The **-clk** option selects the primary source timing for transmitting messages over the line. Replace <*clockSource*> with **1** to use the clock signal received over this line from a remote node, or specify **2** to use the local timing defined for the local switch. **Note** On SRME/B cards, when the selected primary source timing is not operating properly, the SRME/B will use the other timing option. For example, if you select option 1 as the primary source, option 2 will be the secondary source and will be used when the option 1 timing fails. For information on defining the clock source for the local switch, see the "Managing the Time of Day Across the Network Using SNTP" section in Chapter 9, "Switch Operating Procedures."

Table 5-1 Parameters for SONET Line Configuration (continued)

Parameter	Description
-lpb	Enables one of two loopback types or disables an active loopback, as follows: • 1: No loopback • 2: Local loopback • 3: Remote loopback A loopback circulates OAM cells between the card and the CPE in a local loopback or between the card and the network in a remote loopback. The loopback continues until you halt it by again running the cnfln command with the parameter sequence -lpb 1. Default: no loopback
-sfs	Enables/disables the frame scramble feature. Replace <FrameScramble> with 1 to disable frame scramble, or 2 to enable frame scramble.
-rdiv	Specifies the number of RDI V bits. Replace <*RDI-V Type*> with either a “1” for 1 bit or a “3” for 3 bits.
-rdip	Specifies the number of RDI P bits. Replace <*RDI-V Type*> with either a “1” for 1 bit or a “3” for 3 bits.
-tt	The TributaryType selects a tributary type for either SONET or SDH. SONET references virtual tributary (VT) types, and SDH references virtual container (VC) types. Select the tributary type that supports the line type used by the service modules using this SONET/SDH line: • T1 lines (VT15/VC11) = 1 • E1 lines (VT2/VC12) = 2 **Note** E1 lines (VT2/VC12) are supported only when the -slt option is set to 2 to select SDH.
-tm	The tributary mapping type can be configured as asynchronous or byte-synchronous. Type a “1” or “2.” • Asynchronous = 1 • Byte-synchronous (T1 tributary type only) = 2 Default: asynchronous
-tf	The tributary framing type is either superframe or extended superframe. This option applies only when the tributary mapping is byte-synchronous (**-tm 2**). Replace *TributaryFramingType* with **2** to specify Superframe, or **3** to specify extended superframe.

Table 5-1 Parameters for SONET Line Configuration (continued)

Parameter	Description
-st	The signaling transport mode applies only if you have selected byte-synchronous tributary mapping (**-tm 2**). Replace *SignallingTranportMode* with either a **2** to specify transfer mode, or a **3** to specify clear mode. With transfer mode, the framing bit is transferred to the VT header. With clear mode, the signaling bit is transferred to the VT header.
-tg	The tributary grouping type applies to SDH. Replace *TributaryGroupingType* with a **2** to specify AU3, or a **3** to specify AU4.

Step 4 To verify your configuration changes, enter the **dspln -sonet** <*X*.1> command. Replace *X* with the slot number of the SRM you are configuring.

Configuring T3 Lines

The following procedure describes how to configure T3 lines on SRM-3T3/C cards and on SRME/B cards with T3 interfaces.

Step 1 Establish a configuration session using a user name with GROUP1 privileges or higher.

Step 2 If you do not know the line number you want to configure, enter the **dsplns** command to display a list of the lines.

```
mgx8830b.1.PXM.a > dsplns <logical slot>
```

Remember that you cannot configure a line until you have brought it up as described in the section, “Bringing Up Lines.”

In the following example, the user displays the line numbers for the SRM in slot 7.

```
Lampoon.1.PXM.a > dsplns 7
  Line Line      Line        Line     Length  OOF       AIS
  Num  State     Type        Lpbk    (meters) Criteria  cBitsCheck
  ---- ----- ----------- ----------- -------- --------- ----------
   7.1  Down dsx3CbitPar      NoLoop 00000001  3Of8Bits      Check
   7.2  Down dsx3CbitPar      NoLoop 00000001  3Of8Bits      Check
   7.3  Down dsx3CbitPar      NoLoop 00000001  3Of8Bits      Check
```

Step 3 To display the current configuration of a line, enter the **dspln -ds3** <*X.line*> command.

If you are configuring a Cisco MGX 8850 (PXM1E/PXM45) switch, replace *X* with 15 for an SRM in the upper bay, or 31 for an SRM in the lower bay. If you are configuring a Cisco MGX 8830 switch, replace *X* with 7. Replace *line* with the line number, which is in the range of 1 to 3 on an SRM-3T3/C card.

In the following example, the user displays the configuration for the T3 line connected to line 1 on the SRM card in slot 7.

```
Lampoon.1.PXM.a > dspln -ds3 7.1
  Line Number         : 7.1
  Admin Status        : Up
  Line Type           : dsx3CbitParity
  Line Coding         : ds3B3ZS
  Line Length(meters) : 1
  OOFCriteria         : 3Of8Bits
  AIS c-Bits Check    : Check
  Loopback            : NoLoop
  Xmt. Clock source   : localTiming
  Rcv FEAC Validation : 4 out of 5 FEAC codes
```

Step 4 To configure a T3 line, enter the **cnfln** command as follows:

```
mgx8830b.1.PXM.a > cnfln -ds3 <slot.line> -lt <LineType> -len <LineLength> -oof
<OOFCriteria> -cb <AIScBitsCheck> -rfeac <RcvFEACValidation> -clk <clockSource>
```

Table 5-2 lists the parameter descriptions for configuring T3 lines.

Table 5-2 Parameters for T3 Line Configuration

Parameter	Description
slot.line	If you are configuring a Cisco MGX 8850 (PXM1E/PXM45) switch or an MGX 8880 Media Gateway, replace *slot* with 15 for an SRM in the upper bay, or 31 for an SRM in the lower bay. If you are configuring a Cisco MGX 8830 switch, replace *slot* with 7. Replace *line* with the number that corresponds to the back card port to which the line is connected.
-lt	T3 line type. Replace *LineType* with **9** to specify this line as a dsx3M23 line, or **11** to specify the line as a dsx3CbitParity line.
-len	Specifies the line length. Replace <*LineLength*> with a number to specify 0 through 64000 meters.
-oof	Specifies Out of Frame (OOF) criteria. Replace <*OOFCriteria*> with **1** to specify a criteria of 3 out of 8 frames, or replace it with **2** to specify a criteria of 3 out of 16 frames. **Note** Option 2, 3 out of 16 frames, is the only option supported on SRME/B cards.
-cb	Specifies the C-bit check. Replace <*AIScBitsCheck*> with **1** to check bits, or **2** to disable a bits check. **Note** Option 1, check C-bits, is the only option supported on SRME/B cards.

Table 5-2 Parameters for T3 Line Configuration (continued)

Parameter	Description
-clk	The **-clk** option selects the source timing for transmitting messages over the line. Replace <*clockSource*> with **1** to use the clock signal received over this line from a remote node, or specify **2** to use the local timing defined for the local switch. For information on defining the clock source for the local switch, see the "Managing the Time of Day Across the Network Using SNTP" section in Chapter 9, "Switch Operating Procedures." **Note** This option does not apply to SRME/B cards. SRME/B cards operate in free run mode.
-rfeac	Specifies the number of bits for FEAC validation. Replace <*RcvFEACValidation*> with either a **1** to specify 4 out of 5 bits, or **2** to specify 8 out of 10 bits. **Note** Option 1, 4 out of 5 bits, is the only option supported on SRME/B cards.

Step 5 To verify your configuration changes, enter the **dspln -ds3** <*X.line*> command.

If you are configuring a Cisco MGX 8850 (PXM1E/PXM45) switch, replace *X* with 15 for an SRM in the upper bay, or 31 for an SRM in the lower bay. If you are configuring a Cisco MGX 8830 switch, replace *X* with 7. Replace *line* with the line number, which is in the range of 1 to 3 on an SRM-3T3/C card.

Establishing Redundancy Between SONET/SDH Lines with APS

On Cisco MGX 8850 (PXM1E/PXM45) and Cisco MGX 8830 switches, the SRME and SRME/B support intercard redundancy, where the working line is connected to the primary card, and the protection line is connected to the secondary card.

Note T3 configurations of SRM do not support APS redundancy.

To establish redundancy between two lines on different cards, use the following procedure.

Note For intercard APS to operate properly on a Cisco MGX 8850 (PXM1E/PXM45), an APS connector must be installed between the two SRM back cards. For more information in the APS connector and how to install it, refer to either the *Cisco MGX 8850 (PXM1E/PXM45), Cisco MGX 8950, Cisco MGX 8830, and Cisco MGX 8880 Hardware Installation Guide, Releases 2 Through 5*. For a Cisco MGX 8830 shelf, you do not need to install a separate APS connector between the two SRM cards because APS functionality is built into the switch.

Step 1 Establish a configuration session with the active PXM using a user name with GROUP1_GP privileges or higher.

> **Note** All SRM configuration is done from the active PXM card.

Step 2 Verify that the switch has redundant SRM back cards installed in all bays that will support bulk distribution and line redundancy (redundant SRM back cards can support a standalone PXM/SRM installation). For more information, refer to the *Cisco MGX 8850 (PXM1E/PXM45), Cisco MGX 8950, Cisco MGX 8830, and Cisco MGX 8880 Hardware Installation Guide, Releases 2 Through 5*.

Step 3 If you have not done so already, bring up the working line as described in the “Bringing Up Lines” section earlier in this chapter. The working line is the line on the primary SRME card, which will be in slot 7, 15, or 31.

Step 4 If you are configuring an SRM on a Cisco MGX 8850 (PXM1E/PXM45), enter the **dspapsbkplane** command to verify that an APS connector is in the bay where APS is to be configured. For example.

```
PXM_SJ.7.PXM.a > dspapsbkplane
This feature does not apply to the card present in this slot

SRME Top Bay:APS Back Plane Not Engaged or Adjacent Back Card Not Present.

SRME Bottom Bay:APS Back Plane Is Engaged
```

> **Note** APS functionality is built into the Cisco MGX 8830. Therefore, you do not need to install a separate APS connector in the switch in order for APS to function.

Step 5 Enter the **addapsln** command as follows:

```
mgx8850b.1.PXM.a > addapsln <workingIndex> <protectIndex> <archmode>
```

Replace *workingIndex* and *protectIndex* with the location of the working and protection lines, which must be entered in the format: *slot.bay.line*. Because the SRM SONET/SDH configurations provides one line, the working and protection indexes can only have one possible for value for a specific switch and bay. Table 5-3 shows the proper values to enter for each switch and bay combination.

Table 5-3 Working and Protection Indexes for addapsln Command

Switch Type and Bay	Working Index	Protection Index
Cisco MGX 8830	7.1.1	8.1.1
Cisco MGX 8850 (PXM1E/PXM45), upper bay	15.1.1	16.1.1
Cisco MGX 8850 (PXM1E/PXM45), lower bay	31.1.1	32.1.1

Replace *archmode* with an option number that defines the type of line redundancy you want to use. Table 5-4 shows the option numbers and the types of redundancy they select.

Table 5-4 APS Line Architecture Modes

Option	Description
1	Selects 1+1 Bellcore GR-253 APS protocol signaling (transmission on both working and protection lines).
2	Selects 1:1 Bellcore GR-253 APS protocol signaling (transmission on either the working line or the protection line) for intracard APS. **Note** This option is not supported in this release.
3	Selects 1+1 ITU-T G.783 AnnexB APS protocol signaling (transmission on both working and protection lines).
4	Selects 1+1 Y-cable signaling without K1 and K2. **Note** This option is not supported in this release.
5	Selects 1+1 straight cable signaling without K1 and K2. **Note** This option is not supported in this release.

The following example configures 1+1 APS line redundancy for the lower bay of a Cisco MGX 8850 (PXM1E/PXM45) switch:

```
mgx8850b.1.PXM.a > addapsln 31.1.1 32.1.1 1
```

Step 6 Enter the **cnfapsln** command to configure the APS line, as follows:

```
mgx8850b.1.PXM.a > cnfapsln -w <workingline> -sf <SignalFaultBER> -sd <SignalDegradeBER>
-wtr <Wait To Restore> -dr <direction> -rv <revertive> -proto <protocol>
```

Table 5-5 describes the command parameters.

Table 5-5 cnfapsln Command Parameters

Option	Description
-w	Replace *workingline* with the location of the working line using the format *slot.bay.line*. The possible choices are: • Cisco MGX 8830 = 7.1.1 • Cisco MGX 8850 (PXM1E/PXM45), upper bay = 15.1.1 • Cisco MGX 8850 (PXM1E/PXM45), lower bay = 31.1.1
-sf	Replace <*SignalFaultBER*> with one of the following numbers to indicate the Signal Fault Bit Error Rate (BER), in negative powers of ten: • 3 = 10^{-3} • 4 = 10^{-4} • 5 = 10^{-5} Example: `-sf 3`

Table 5-5 cnfapsln Command Parameters (continued)

Option	Description
-sd	Replace <*SignalDegradeBER*> with one of the following numbers to indicate the Signal Degrade Bit Error Rate (BER), in negative powers of ten: • 5 = 10^{-5} • 6 = 10^{-6} • 7 = 10^{-7} • 8 = 10^{-8} • 9 = 10^{-9} Example: `-sd 5`
-wtr	Replace *Wait To Restore* with the number of minutes to wait after the working line has become functional again, before switching back to the working line from the protection line. The range is 5-12. Example: `-wtr 5`
-dr	Determines whether the line is unidirectional or bidirectional. • 1 = Unidirectional. The line switch occurs at the receive end of the line. • 2 = Bidirectional. The line switch occurs at both ends of the line. **Note** This optional parameter is not shown in the above example because you do not need to set it for a revertive line. Example: `-dr 2`
-rv	Enables/disables revertive behavior. Replace *revertive* with the number **1** to disable revertive behavior, or **2** to enable revertive behavior. Example: `-rv 1`
-proto	Replace *protocol* with the number **1** to specify the Bellcore protocol, **2** to specify the ITU protocol.

Step 7 To display the a list of all the APS lines on an SRM card, enter the **dspapslns** command.

Step 8 To display the configuration of a single APS line, enter the **dspapsln** command as follows:

```
M8850_LA.8.PXM.a > dspapsln 15.1.1
```

For information on managing redundant APS lines, see the “Managing Redundant APS Lines” section in Chapter 9, “Switch Operating Procedures.”

Linking Service Module Lines to SRM Channels, VTs, or VCs

Once you have brought up the line or lines on your SRM card, you are ready to establish links, which are configured mappings between the service module lines and the channels, virtual tributaries (VTs), or virtual containers (VCs) within an SRM line. For example, you might create a link to connect line 1 in slot 14 to channel 5 within an SRM-3T3/C line.

Once you establish a link for a service module line, bulk distribution is enabled for the entire service module and all lines must use bulk distribution. Although bulk distribution will work with a service module back card installed, the service module cannot use the back card once bulk distribution is enabled on any line.

Note The SRME and SRME/B cards support bulk distribution to E1 cards only when the SDH line type is selected while configuring a line. The SRM-3T3/C card does not support bulk distribution to E1 service modules.

To link a service module line to an SRM channel, VT, or VC and enable bulk distribution, use the following procedure:

Step 1 Establish a configuration session with the active PXM using a user name with GROUP1_GP privileges or higher.

Step 2 Enter the **addlink** command on the active PXM to bring up a link between a service module line and an SRM channel, VT, or VC.

```
mgx8830b.1.PXM.a > addlink <SrmStartLinkIf> <NumberOfLinks> <TargetIF>
```

Table 5-6 describes the command parameters.

Table 5-6 addlink Command Parameters

Option	Description
SrmStartLinkIf	Logical SRM slot and link number, in the form of *slot.line.link*. For a Cisco MGX 8850 (PXM1E/PXM45) switch or a Cisco MGX 8880 Media Gateway, replace *slot* with 15 for the upper bay or 31 for the lower bay. For a Cisco MGX 8830 switch, the logical slot number is 7. Replace *line* with **1** for SONET/SDH interfaces or a number in the range of 1 to 3 for T3 interfaces. The *link* number identifies the starting link number on the SRM line you are configuring. The link number must be available (no other line connected to it). Replace *link* with a number in one of the following ranges: • SONET/SDH interfaces, T1 line tributary type configuration (VT15/VC11) = range 1 to 84 • SONET/SDH interfaces, E1 line tributary type configuration (VT2/VC12) = range 1 to 63 • T3 interfaces, range 1 to 28 **Note** T3 links 1 through 28 for each line connect to channels 1 to 28, respectively in the respective T3 line. The links within a SONET SDH line map to the VTs and VCs within a line as listed in Table 5-7, Table 5-8, and Table 5-9.

Table 5-6 addlink Command Parameters (continued)

Option	Description
NumberOfLinks	The number of links you want to configure with this command. Replace *NumberOfLinks* with a number from 1 through 8. If you specify 1, you will create one link. If you specify 8, you can configure links for all 8 lines on a service module at the same time.
TargetIF	Targeted starting line in the format *slot.line*. To see which slots are hosting service modules that can use bulk distribution, enter the **dspcds** command and note the 8-port T1 service modules that are in the same bay as the SRM card. The *line* is the starting line number and defines which line will be the first of the group of lines to be configured. For example, if you enter 1 for the number of links to configure and 4 for the target line number, only one link will be configured for line 4 on the target service module. If you specify 8 for the number of links and 1 for the target line, all 8 lines on the target service module are configured for bulk distribution.

In the following example, 8 links are created for all 8 lines on the service module in slot 14. The starting link number on the SRM is 1.

```
M8850_LA.8.PXM.a > addlink 15.1.1 8 14.1
```

Step 3 Enter the **dsplink** <*LogicalSRMslot.Line*> command to verify your configuration. Replace <*LogicalSRMslot.Line*> with the slot number of the SRM card and the line number you wish to view. In the following example, the user displays the configuration for line 1 on the SRM card represented by logical slot 15.

```
M8850_LA.8.PXM.a > dsplink 15.1
Line Num  VtNum  RowStatus  TargetSlot  TargetSlotLine FramingType
========  ====== ========== ==========  ============== ===========
  1        1       Add         14            1         Not Appl
  1        2       Add         14            2         Not Appl
  1        3       Add         14            3         Not Appl
  1        4       Add         14            4         Not Appl
  1        5       Add         14            5         Not Appl
  1        6       Add         14            6         Not Appl
  1        7       Add         14            7         Not Appl
  1        8       Add         14            8         Not Appl
```

Table 5-7 shows the correlation between VTs, virtual tributary groups (VTGs), and SRM link numbers when a SRME or SRME/B line is configured for the SONET line type.

Table 5-7 SRM SONET Virtual Tributary Mapping

SRME Link Number	VTG No.	VT No.	SRME Link Number	VTG No.	VT No.
1	1	1	**43**	1	3
2	2	1	**44**	2	3
3	3	1	**45**	3	3
4	4	1	**46**	4	3
5	5	1	**47**	5	3

Table 5-7 SRM SONET Virtual Tributary Mapping (continued)

SRME Link Number	VTG No.	VT No.	SRME Link Number	VTG No.	VT No.
6	6	1	**48**	6	3
7	7	1	**49**	7	3
8	1	2	**50**	1	4
9	2	2	**51**	2	4
10	3	2	**52**	3	4
11	4	2	**53**	4	4
12	5	2	**54**	5	4
13	6	2	**55**	6	4
14	7	2	**56**	7	4
15	1	3	**57**	1	1
16	2	3	**58**	2	1
17	3	3	**59**	3	1
18	4	3	**60**	4	1
19	5	3	**61**	5	1
20	6	3	**62**	6	1
21	7	3	**63**	7	1
22	1	4	**64**	1	2
23	2	4	**65**	2	2
24	3	4	**66**	3	2
25	4	4	**67**	4	2
26	5	4	**68**	5	2
27	6	4	**69**	6	2
28	7	4	**70**	7	2
29	1	1	**71**	1	3
30	2	1	**72**	2	3
31	3	1	**73**	3	3
32	4	1	**74**	4	3
33	5	1	**75**	5	3
34	6	1	**76**	6	3
35	7	1	**77**	7	3
36	1	2	**78**	1	4
37	2	2	**79**	2	4
38	3	2	**80**	3	4
39	4	2	**81**	4	4
40	5	2	**82**	5	4

Table 5-7 SRM SONET Virtual Tributary Mapping (continued)

SRME Link Number	VTG No.	VT No.	SRME Link Number	VTG No.	VT No.
41	6	2	**83**	6	4
42	7	2	**84**	7	4

Table 5-8 shows how each SRM link is mapped to a tributary unit group 2 (TUG-2) and a tributary unit (TU) or VC within a SDH line when the administrative unit 3 (AU3) tributary group type is selected.

Note You cannot mix T1 and E1 signals in a single TUG-2.

Table 5-8 SRM SDH AU3 TUG-2 and TU/VC Mapping

SRME Link Number	TUG-2 No.	TU-12/VC-12 No.	SRME Link Number	TUG-2 No.	TU-12/VC-12 No.
1	1	1	**33**	1	2
2	2	1	**34**	2	2
3	3	1	**35**	3	2
4	4	1	**36**	4	3
5	5	1	**37**	5	3
6	6	1	**38**	6	3
7	7	1	**39**	7	3
8	1	2	**40**	1	3
9	2	2	**41**	2	3
10	3	2	**42**	3	3
11	4	2	**43**	4	1
12	5	2	**44**	5	1
13	6	2	**45**	6	1
14	7	2	**46**	7	1
15	1	3	**47**	1	1
16	2	3	**48**	2	1
17	3	3	**49**	3	1
18	4	3	**50**	4	2
19	5	3	**51**	5	2
20	6	3	**52**	6	2
21	7	3	**53**	7	2
22	1	1	**54**	1	2
23	2	1	**55**	2	2
24	3	1	**56**	3	2
25	4	1	**57**	4	3

Table 5-8 SRM SDH AU3 TUG-2 and TU/VC Mapping (continued)

SRME Link Number	TUG-2 No.	TU-12/VC-12 No.	SRME Link Number	TUG-2 No.	TU-12/VC-12 No.
26	5	1	**58**	5	3
27	6	1	**59**	6	3
28	7	1	**60**	7	3
29	1	2	**61**	1	3
30	2	2	**62**	2	3
31	3	2	**63**	3	3
32	4	2			

Table 5-9 shows how each SRM link is mapped to a tributary unit group 3 (TUG-2), TUG-2, and a TU or VC within an SDH line when the AU4 tributary group type is selected.

Note You cannot mix T1 and E1 signals in a single TUG-2.

Table 5-9 SRM SDH AU4 TUG-3, TUG-2, and TU/VC Mapping

SRME Link Number	TUG-3 No.	TUG-2 No.	TU-12/VC-12 No.	SRME Link Number	TUG-3 No.	TUG-2 No.	TU-12/VC-12 No.
1	1	1	1	**33**	2	1	2
2	1	2	1	**34**	2	2	2
3	1	3	1	**35**	2	3	2
4	1	4	1	**36**	2	4	3
5	1	5	1	**37**	2	5	3
6	1	6	1	**38**	2	6	3
7	1	7	1	**39**	2	7	3
8	1	1	2	**40**	2	1	3
9	1	2	2	**41**	2	2	3
10	1	3	2	**42**	2	3	3
11	1	4	2	**43**	3	4	1
12	1	5	2	**44**	3	5	1
13	1	6	2	**45**	3	6	1
14	1	7	2	**46**	3	7	1
15	1	1	3	**47**	3	1	1
16	1	2	3	**48**	3	2	1
17	1	3	3	**49**	3	3	1
18	1	4	3	**50**	3	4	2
19	1	5	3	**51**	3	5	2
20	1	6	3	**52**	3	6	2

Table 5-9 SRM SDH AU4 TUG-3, TUG-2, and TU/VC Mapping (continued)

SRME Link Number	TUG-3 No.	TUG-2 No.	TU-12/VC-12 No.	SRME Link Number	TUG-3 No.	TUG-2 No.	TU-12/VC-12 No.
21	1	7	3	**53**	3	7	2
22	2	1	1	**54**	3	1	2
23	2	2	1	**55**	3	2	2
24	2	3	1	**56**	3	3	2
25	2	4	1	**57**	3	4	3
26	2	5	1	**58**	3	5	3
27	2	6	1	**59**	3	6	3
28	2	7	1	**60**	3	7	3
29	2	1	2	**61**	3	1	3
30	2	2	2	**62**	3	2	3
31	2	3	2	**63**	3	3	3
32	2	4	2				

Where To Go Next

When your line configuration is complete and links have been established (if using bulk distribution), you are ready to start provisioning connections. To provision connections on a particular service module, you need to refer to the appropriate software configuration guide (see Table 1-1).

CHAPTER 6

Preparing RPM Cards for Operation

This chapter describes how to do the following tasks:

- Determine which slots host the RPM cards
- Initialize RPM cards that are installed in the switch
- Verify the software version used on the RPM cards
- Configure backup cards for RPM cards
- Where to find additional information on configuring RPM cards

Note Some of the procedures in this chapter require you to enter Cisco IOS commands that run on the RPM cards. The procedures in this chapter do not describe how to use Cisco IOS, but they do include examples that list all the Cisco IOS commands needed to complete the procedure. For more information on any Cisco IOS command, refer to the Cisco IOS documentation.

Configuration Quickstart

The quickstart procedure in this section provides a summary of the tasks required to prepare RPM cards for operation. This procedure is provided as an overview and as a quick reference for those who have already configured Cisco MGX switches.

	Command	Purpose
Step 1	*username* *<password>*	Start a configuration session. **Note** To perform all the procedures in this quickstart procedure, you must log in as a user with SUPER_GP privileges or higher.
Step 2	**dspcds** **dspcd** **cc** <*slotnumber*>	Locate RPM cards that need to be configured. See the “Locating RPM Cards in the Switch” section later in this chapter.

	Command	Purpose
Step 3	**boot system** x:<*filename*> **boot config e:auto_config_***slot* **copy run start** **cc 7** **resetcd** *slot* Related commands: **dspcds**	Initialize RPM cards by identifying a runtime software file and storing the configuration on the PXM hard disk. See the "Initializing RPM Cards" later in this chapter.
Step 4	**show version**	Verify the software version for each RPM card. See the "Verifying the Software Version in Use" later in this chapter.
Step 5	**addred** <*options*>	Define RPM secondary cards that will operate as backup cards for RPM primary cards. See the "Establishing Redundancy Between RPM Cards" later in this chapter.

Locating RPM Cards in the Switch

You already have the location of the RPM cards if you have completed the appropriate hardware survey worksheet (See "Verifying the Hardware Configuration" in Chapter 2, "Configuring General Switch Features"). That section describes how to locate the RPM cards, as well as other switch cards, and how to determine if the RPM front and back cards are installed in the correct slots.

Understanding dspcds and dspcd Displays for RPM

The **dspcds** and **dspcd** displays for RPM cards are similar to those for other cards, but they contain the following differences:

- RPM-PR cards are identified as RPM_PR cards.
- RPM-XF cards are identified as RPM_XF cards
- If one or more RPM back cards are installed for an RPM card, the status for the appropriate bay changes from Empty to Active. The switch does not detect and display the card type or software revision status.
- The Standby status for the front card indicates that the card is either operating in boot mode, or that the card is operating as a standby card for another RPM card.

The following example shows the **dspcd** command display for an RPM-PR card:

```
M8850_LA.8.PXM.a > dspcd 9
M8850_LA                         System Rev: 04.09   Jul. 17, 2003 22:48:11 GMT
MGX8850                                              Node Alarm: CRITICAL
Slot Number:   9    Redundant Slot: NONE

                    Front Card          Upper Card          Lower Card
                    ----------          ----------          ----------

Inserted Card:      RPM_PR              4E_B_RJ45           FE_RJ45
Reserved Card:      RPM_PR              UnReserved          UnReserved
State:              Active              Active              Active
Serial Number:      SAK0419001H         SBK051700VX         SBK0512013X
Prim SW Rev:        ---                 ---                 ---
Sec SW Rev:         ---                 ---                 ---
Cur SW Rev:         12.3(1.7)T1         ---                 ---
Boot FW Rev:        12.2(7.4)T          ---                 ---
800-level Rev:      10                  B0                  B1
800-level Part#:    800-07178-01        800-12134-01        800-02735-02
CLEI Code:          BAA6PT0CAA          BAEIABGAAA          BAEIAAAAAA
Reset Reason:       On Reset From Shell
Card Alarm:         NONE
Failed Reason:      None
Miscellaneous Information:

Type <CR> to continue, Q<CR> to stop:
M8850_LA                         System Rev: 04.09   Jul. 17, 2003 22:48:11 GMT
MGX8850                                              Node Alarm: CRITICAL

Crossbar Slot Status:      No Crossbar

Alarm Causes
------------
    NO ALARMS

Backcard Mismatch Reasons
-------------------------

Upper Card
----------
    NO MISMATCH

Lower Card
----------
    NO MISMATCH
```

The next example shows the **dspcd** command display for an RPM-XF:

```
M8850_SF.7.PXM.a > dspcd 1
M8850_SF                        System Rev: 04.00   Apr. 23, 2003 05:27:37 GMT
MGX8850                                             Node Alarm: CRITICAL
Slot Number:   1    Redundant Slot: NONE

                    Front Card          Upper Card          Lower Card
                    ----------          ----------          ----------

Inserted Card:      RPM_XF              MGX-XF-POS-2-OC12   MGX-XF-UI
Reserved Card:      RPM_XF              UnReserved          UnReserved
State:              Active              Active              Active
Serial Number:      SAG054578LL         SAG06300JUC         SAG06493Q64
Prim SW Rev:        ---                 ---                 ---
Sec SW Rev:         ---                 ---                 ---
Cur SW Rev:         12.2(20021123:000514)                   ---
Boot FW Rev:        12.2(8)YP           ---                 ---
800-level Rev:      14                  01                  A0
800-level Part#:    800-09307-02        800-21300-02        800-09492-02
CLEI Code:                              CLEI2POS10          BA5ASRYFAA
Reset Reason:       On Reset from PXM
Card Alarm:         NONE
Failed Reason:      None
Miscellaneous Information:
```

Initializing RPM Cards

RPM cards are shipped with the latest software installed on the card, and they will operate as soon as the card is installed. After you install the card, you must initialize the card. Initializing the card prepares the card as follows:

- Configures the card to use the runtime RPM software image stored on the PXM hard disk.
- Configures the card to store the configuration file on the PXM hard disk.

Storing the configuration on the hard disk is essential for the following reasons:

- If an active RPM card fails and the configuration is not stored on the disk, the standby RPM card cannot become active.
- The switch **saveallcnf** command cannot store configuration information that is not on the PXM hard disk.

When the RPM card starts or reboots, it searches for the configuration file in the following sequence:

- If there is a configuration file only on the PXM hard disk, the RPM card uses the configuration stored on the hard disk.
- If there is no configuration file on the hard disk, then the NVRAM version is used.
- If configuration files exist on both the hard drive and bootflash, the switch examines a timestamp tag in each file. If the timestamp tag is the same in both files, the RPM card uses the configuration file stored in bootflash. If the timestamp tag is different, the RPM card uses the configuration file stored on the hard drive.

To initialize an RPM card, use the following procedure.

Step 1 Establish a configuration session with the switch using a user name at any access level.

Note Access to the RPM configuration is secured by the Cisco IOS software running on the card.

Step 2 To display the files that can be used to start RPM cards, enter the **cd** command to select the C:FW directory, and enter the **ll** command to display the directory contents. For example:

```
M8850_LA.8.PXM.a > cd FW

M8850_LA.8.PXM.a > ll

Listing Directory .:
drwxrwxrwx  1 0       0            13312 May 11 15:47 ./
drwxrwxrwx  1 0       0            13312 May 11 17:10 ../
-rwxrwxrwx  1 0       0          2253552 May 11 15:47 mpsm_t1e1_030.000.004.016-P2.fw
-rwxrwxrwx  1 0       0         10655280 Apr  2 08:46 rpm-js-mz.123-2.T5
-rwxrwxrwx  1 0       0          3350304 Apr  2 08:46 rpm-boot-mz.123-2.T5
-rwxrwxrwx  1 0       0          1431512 May 11 15:47 mpsm_t1e1_030.000.004.016-P1_bt.fw
-rwxrwxrwx  1 0       0          1030532 May 11 15:46 frsm_vhs_022.000.005.019-A.fw
-rwxrwxrwx  1 0       0           891552 May 11 15:46 frsm_8t1e1_022.000.005.019-A.fw
-rwxrwxrwx  1 0       0           303936 May 11 15:46 cesm_t3e3_CE8_BT_1.0.02.fw
-rwxrwxrwx  1 0       0           641312 May 11 15:46 cesm_t3e3_022.000.005.019-A.fw
-rwxrwxrwx  1 0       0           743136 May 11 15:46 cesm_8t1e1_022.000.005.019-A.fw
-rwxrwxrwx  1 0       0           826392 May 11 15:38 vxsm_005.000.004.034-A_bt.fw
-rwxrwxrwx  1 0       0         10528336 May 11 15:38 vxsm_005.000.004.034-A.fw
-rwxrwxrwx  1 0       0          7939476 May 11 15:38 pxm45_005.000.004.034-A_mgx.fw
-rwxrwxrwx  1 0       0          1160328 May 11 15:37 pxm45_005.000.004.034-A_bt.fw
-rwxrwxrwx  1 0       0           468388 May 11 15:46 frsm_vhs_VHS_BT_1.0.06.fw
-rwxrwxrwx  1 0       0          1245112 May 11 15:37 mpsm155_005.000.004.034-P1_bt.fw
-rwxrwxrwx  1 0       0          4069552 May 11 15:37 mpsm155_005.000.004.034-P1.fw
-rwxrwxrwx  1 0       0           737896 May 11 15:37 frsm12_005.000.004.034-A_bt.fw
-rwxrwxrwx  1 0       0          2490064 May 11 15:37 frsm12_005.000.004.034-A.fw
-rwxrwxrwx  1 0       0          3674368 May 11 15:36 axsmxg_005.000.004.034-P1.fw
-rwxrwxrwx  1 0       0           838840 May 11 15:36 axsmxg_005.000.004.034-A_bt.fw
-rwxrwxrwx  1 0       0           742168 May 11 15:36 axsme_005.000.004.034-A_bt.fw
-rwxrwxrwx  1 0       0           297988 May 11 15:46 frsm_8t1e1_FR8_BT_1.0.02.fw
-rwxrwxrwx  1 0       0           264592 May 11 15:46 cesm_8t1e1_CE8_BT_1.0.02.fw
-rwxrwxrwx  1 0       0          3111904 May 11 15:36 axsme_005.000.004.034-A.fw
-rwxrwxrwx  1 0       0           744600 May 11 15:36 axsm_005.000.004.034-A_bt.fw
-rwxrwxrwx  1 0       0          3267520 May 11 15:36 axsm_005.000.004.034-A.fw
-rwxrwxrwx  1 0       0           248686 May 11 15:32 vism_8t1e1_VI8_BT_3.2.00.fw
-rwxrwxrwx  1 0       0          4135448 May 11 15:32 vism_8t1e1_003.053.103.007-I.fw
-rwxrwxrwx  1 0       0          4135000 May 11 15:32 vism_8t1e1_003.003.103.007-I.fw

In the file system :
    total space :  818961 K bytes
    free  space :  704028 K bytes
```

The file that contains the text *rpm-boot* is for booting the card when the regular runtime image, `rpm-js-mz_123-2.T5` in this example, cannot load. The boot file is stored in bootflash on the card and loaded from that location. The switch never loads the boot code from the PXM hard disk. However, it is common practice to store the boot code on the hard disk in preparation for a bootflash upgrade.

Write down the filename for the runtime image. You will have to enter this filename later in this procedure.

Note If the runtime file is missing, you can transfer the correct file to the switch. This procedure is described in Appendix A, "Downloading and Installing Software Upgrades."

Step 3 Enter the **cc** command to select the card slot in which the RPM card is installed. For example:

```
mgx8850a.7.PXM.a> cc 9

(session redirected)

Router>
```

As shown in the example, the switch displays the prompt for the Cisco IOS software on the RPM card.

Step 4 Verify the configuration status of the RPM card by entering the **show bootflash:** command. For example:

```
Router>show bootflash:
-#- ED --type-- --crc--- -seek-- nlen -length- -----date/time------ name
1   .. image    BAC7D50E  2B80EC   27  2588780 Jul 12 2001 23:05:26 rpm-boot-mz_122-4.T
2   .. config   0EC2C678  2B84F0   18      898 Jul 12 2001 16:04:41 auto_config_slot09

30178064 bytes available (2589936 bytes used)
```

The bootflash contents should contain only the boot file and no configuration files. The example above contains a configuration file (auto_config_slot09), which must be deleted before you initialize the card. Instructions for deleting files appear later in this procedure.

Step 5 Enter enable mode. For example:

```
Router>enable
Password:
Router#
```

Note The default password for enable mode is supplied with your switch. To secure access to your RPM cards, change this password. For information on changing the Enable password, refer to the Cisco IOS documentation.

Step 6 If the bootflash contains any configuration files, use the **delete** command to mark them for deletion. For example:

```
Router#delete bootflash:auto_config_slot09
Delete filename [auto_config_slot09]?
Delete bootflash:auto_config_slot09? [confirm]y
```

This command marks files for deletion, but it does not delete them. The next step removes any files marked for deletion.

Step 7 If the bootflash contains configuration files marked for deletion, remove these files by entering the **squeeze** command. For example:

```
Router#squeeze bootflash:
All deleted files will be removed. Continue? [confirm]y
Squeeze operation may take a while. Continue? [confirm]y
Squeeze of bootflash complete
```

To verify the current bootflash contents, enter the **show bootflash:** command.

Step 8 Enter global configuration mode. For example:

```
Router#configure terminal
Enter configuration commands, one per line.  End with CNTL/Z.
```

Step 9 Enter the **boot system** command using the format:

```
Router(config)# boot system x:<filename>
```

For example:

```
Router(config)#boot system x:rpm-js-mz.122-4.T
```

Step 10 To configure the RPM card to store its configuration on the PXM hard disk, enter the **boot config** command as follows:

```
RPM-PR_mgx8850a_9(config)#boot config e:auto_config_slot
```

The RPM configuration file is named: auto_config_*slot*. The *slot* portion of the name must match the slot number that corresponds to the RPM card.

Note The configuration is also stored in NVRAM using the name *startup-config*.

Tip The RPM software and the configuration files are intentionally stored in different directories. The E:RPM directory on the PXM, which can be accessed by referencing e: in IOS, is backed up whenever the **saveallcnf** command is entered. The C:FW directory, which can be referenced from IOS by entering x:, is not backed up when the switch configuration is saved. When you keep the software files in the C:FW directory, you reduce the sized of saved configuration files, and you reduce the time required to save the configuration.

Step 11 Exit global configuration mode and save your changes with the **copy run start** command. For example:

```
Router(config)#^Z
Router#copy run start
Building configuration...
[OK]
Router#
```

Note The **copy run start** command performs the same function as the older **write mem** command.

This step ensures that your configuration change will not be lost when the router restarts. It also saves the configuration to the PXM hard disk. The following directory listing shows the configuration file that is saved:

```
mgx8850a.7.PXM.a> cd E:RPM

mgx8850a.7.PXM.a> ll
  size          date        time       name
--------       ------      ------    --------
     512    NOV-17-2000  20:01:10    .                 <DIR>
     512    NOV-17-2000  20:01:10    ..                <DIR>
     553    DEC-16-2000  20:40:24    auto_config_slot09

In the file system :
    total space :  102400 K bytes
    free  space :  92334 K bytes
```

Caution If you do not save the configuration changes, you will have to repeat this procedure.

Step 12 To begin using the new configuration, reset the card from the active PXM card. For example:

```
Router#cc 7

(session redirected)

mgx8850a.7.PXM.a> resetcd 9
The card in slot number 9, will be reset. Please confirm action
resetcd: Do you want to proceed (Yes/No)? y
```

When the **dspcds** command display shows that the RPM card is active, the initialization is complete.

Verifying the Software Version in Use

To verify which version of software an RPM card is using, you can use the **dspcd** command or use IOS commands at the router prompt for the RPM card. The following example shows how to display software version information with the IOS **show version** command:

```
Router#show version
Cisco Internetwork Operating System Software
IOS (tm) RPM Software (RPM-JS-M), Experimental Version 12.1(20001205:224609)
[swtools-rpm21a 242]
Copyright (c) 1986-2001 by cisco Systems, Inc.
Compiled Fri 09-Feb-01 01:17 by
Image text-base: 0x60008960, data-base: 0x61326000

ROM: System Bootstrap, Version 12.1(20001003:080040) [swtools-rommon400 102], DEVELOPMENT
SOFTWARE
BOOTFLASH: RPM Software (RPM-BOOT-M), Experimental Version 12.1(20001010:121621)
[swtools-rpm21.nightly 323]

Router uptime is 0 minutes
System returned to ROM by reload
System image file is "x:rpm-js-mz.122-4.T"

cisco RPM (NPE400) processor with 229376K/32768K bytes of memory.
R7000 CPU at 300Mhz, Implementation 39, Rev 2.1, 256KB L2, 4096KB L3 Cache
Last reset from s/w peripheral
Bridging software.
X.25 software, Version 3.0.0.
SuperLAT software (copyright 1990 by Meridian Technology Corp).
TN3270 Emulation software.
1 FastEthernet/IEEE 802.3 interface(s)
1 ATM network interface(s)
125K bytes of non-volatile configuration memory.

32768K bytes of Flash internal SIMM (Sector size 256K).
Configuration register is 0x2
```

The following line in the example above is most important:

```
System image file is "x:rpm-js-mz.122-4.T"
```

The system image file line indicates which file was used to load the software currently in use. In this example, the software was loaded from the x: drive, which corresponds to C:FW on the switch. The filename shown identifies the source file for the running image. This filename is configured in Cisco IOS global configuration mode with the **boot system** command.

Establishing Redundancy Between RPM Cards

RPM cards support one-to-n (1:*n*) card redundancy. With 1:*n* redundancy, one RPM card can serve as a secondary or backup card for multiple RPM cards.

Note Primary and secondary cards can run on incompatible software images. However, the software image on the secondary card must be at the same level or higher than the software image on the primary card.

To establish a backup card for an RPM card, use the following procedure.

Step 1 Establish a configuration session using a user name with SUPER_GP privileges or higher.

Step 2 If you have not done so already, initialize both cards as described earlier in the "Initializing RPM Cards" section.

Step 3 Enter the **dspcds** command to verify that both RPM cards are in the "Active" state.

Note The secondary RPM card must not have any configured connections when it is configured for redundancy.

Step 4 Enter the **addred** command as follows:

```
mgx8850a.7.PXM.a> addred <redPrimarySlotNum> <redSecondarySlotNum> <redType>
```

Replace <*redPrimarySlotNum*> with the slot number of the primary RPM card, and replace <*redSecondarySlotNum*> with the slot number of the secondary RPM card. Replace <*redType*> with the number 2 for 1:*n* redundancy.

After you enter the **addred** command, the switch resets the secondary card; thus, the secondary card will be unavailable for a couple of minutes. When the reset is complete, a **dspcds** command will show the primary and secondary cards in the active and standby states, respectively.

Note The switch only supports RPM-PR and RPM-XF cards. If you insert another card type, such as the RPM/B, the **addred** command will not work.

Step 5 Enter the **cc** command to select the card slot in which the primary RPM-PR card is installed. For example:

```
mgx8850a.7.PXM.a> cc 9
```

Step 6 Enter global configuration mode. For example:

```
Router>enable
Password:
Router#configure terminal
Enter configuration commands, one per line.  End with CNTL/Z.
```

Step 7 Configure the RPM card to store its configuration on the PXM hard disk by entering the **boot config** command as follows:

```
Router>boot config e:auto_config_slot#
```

Note This step is required. When switchover occurs, the secondary RPM card must be able to load the configuration from the auto_config file on the PXM hard disk. If this command is already configured in the startup configuration file, you do not need to repeat this command.

Step 8 Enter the **copy run start** command on the primary RPM card to save the configuration changes.

```
Router> copy run start
```

Step 9 To display the redundancy relationship between all cards in the switch, enter the **dspred** command.

For information on managing redundant cards, see the "Managing Redundant Cards" section in Chapter 9, "Switch Operating Procedures."

Configuring SNMP on the RPM Card

To configure the SNMP community string on an RPM card, you need to use IOS commands at the router prompt for the RPM card. The following example shows how to do this.

Step 1 Log in to the RPM card to determine whether the switch interface is active.

```
Router# enable
Router>(enable):show interfaces
```

Step 2 If the switch interface is not active, enter the **config terminal** command to activate it. The following example shows you how to do this.

```
Router# config terminal
Router(config)#int switch 1
Router(config)#no shut
end
```

Step 3 Enter the **show run** command to display the running configuration and verify SNMP information.

```
Router# show run
....
....
snmp-server community public RW
snmp-server community private RW
....
....
```

Step 4 To change the read-write community string, enter the **config terminal** command. The following example shows you how to do this.

```
Router#config terminal
Router(config) snmp-server community POPEYE RW
```

Step 5 Enter the **exit** command to get out of config terminal mode.

```
Router(config)#exit
```

Step 6 Enter the **copy run start** command to save the configuration for use at startup.

```
RPM-PR_mgx8850a_9#copy run start
Destination filename [startup-config]?
Building configuration...
[OK]
RPM-PR_LA_9#
```

Where to Go Next

After the RPM card is initialized and any required redundancy is established, you can configure the RPM card to operate in either of the following roles:

- Label Switch Controller (LSC)
- Label Edge Router (LER)

Note RPM operation as an LSC is supported only on Cisco MGX 8850 (PXM45) and Cisco MGX 8950 switches. If you are configuring a Cisco MGX 8850 (PXM1E) or a Cisco MGX 8830 switch, the RPM card can only operate as an LER.

When operating in the LER role, the RPM card can use Ethernet connections on the RPM back cards to connect to IP networks. The LSC and LER roles, and the RPM Ethernet connections, are all defined using Cisco IOS commands, which run on the RPM card. To start using Cisco IOS from a switch CLI session, enter the **cc** command to change cards to the RPM slot.

For instructions on configuring the RPM-PR card with Cisco IOS commands, refer to the *Cisco MGX Route Processor Module (RPM-PR) Installation and Configuration Guide, Release 2.1*. For instructions on configuring the RPM-XF card with Cisco IOS commands, refer to the *Cisco MGX Route Processor Module (RPM-XF) Installation and Configuration Guide, Release 4*.

Managing Service Class Templates

A Service Class Template (SCT) is a file that contains default configuration data for switch connections and for configuring the hardware to support connections. When you configure a connection, or when an SVC is established, the switch analyzes the connection setup request data, any local configuration data, and the SCTs that apply to the port and to the card. For example, if an SPVC configuration does not include required data for the requested class of service (COS), default values from the SCT files are used. If an SVC request or SPVC configuration specifies configuration values that are different from the SCT values, the specified values override the default SCT values.

There are two types of SCTs: card SCTs and port SCTs. Card SCTs define configuration parameters for the hardware that transfers data between the a service module and the switch back plane. You can assign one card SCT to each service module.

Note The PXM1E supports port SCTs only. PXM1E cards do not support card SCTs.

Port SCTs define configuration parameters for the hardware that transfers data between a PXM1E or service module and a communication line to another switch or CPE. Port SCTs are assigned when a port is configured, and you can use different port SCTs on the same card, provided that the port SCT you select is designed for that card type.

Some SCT parameters control the PXM1E or service module hardware, and others are used as default values for connection parameters. A complete discussion of the SCT parameters is beyond the scope of this book.

SCT parameters are used to do the following:

- connection policing
- connection admission control (CAC)
- provide default connection parameters
- provide connection threshold parameters
- set up class of service buffer (COSB) parameters and threshold values

SCTs simplify configuration by providing default values that will work for most connections. This reduces the number of parameters that need to be defined when setting up connections. When configuring a service module card SCT, your goal should be to select the card SCT that will support the majority of planned connections on that card. When configuring a PXM1E or service module port SCT, your goal should be to select the port SCT that supports the majority of planned connections on that port.

Each PXM1E and service module contains default SCT parameters that you can use for communications. Cisco also supplies additional SCTs that you can use to better support communications. If none of the Cisco supplied SCTs meet your needs, you can use Cisco WAN Manager (CWM) to create your own custom SCTs.

This chapter provides information on the Cisco supplied SCTs, describes how to manage the SCTs available on the switch, and describes how to view the port SCT parameters in use on PXM1E cards.

Note For information on displaying service module SCT parameters, refer to the service module documentation, which is listed in Table 1-1. For more information on configuring SCTs and SCT parameters, refer to the *Cisco WAN Manager User's Guide, Release 15*.

Cisco SCTs

Cisco provides SCTs with the Release 5 software. Each SCT is classified by card or service module type, by whether it is a card or port SCT, and as either policing or non-policing. Although card SCTs may contain policing parameters, these parameters are ignored. Typically, policing SCTs are used on UNI ports at the edge of the ATM network and control traffic entering the network. Non-policing SCTs are typically on trunk ports that interconnect switches within the network.

Note If traffic is properly controlled at the edges of an ATM network, there should be no need for policing within the network.

Table 7-1 lists the SCTs supplied by Cisco in the Release 5 software. For the very latest information on Cisco SCTs, refer to the following release note documents:

- *Release Notes for Cisco MGX 8850 (PXM1E/PXM45), Cisco MGX 8950, and Cisco MGX 8830 Switches, Release 5.0.00*
- *Release Notes for the Cisco MGX 8880 Media Gateway, Release 5.0.00*

Table 7-1 Cisco Provided SCTs

Card Type	SCT Type	SCT ID	PNNI Policing[1]	MPLS Policing[1]	Notes
AXSM	Card[2]	2[3]	N/A	—	There is no operational difference between AXSM card SCTs 2 and 3. Cisco recommends using AXSM card SCT 4 or 5.
		3[3]	N/A	—	
		4	N/A	N/A	There is no operational difference between AXSM card SCTs 4 and 5.
		5	N/A	N/A	
	Port	2[3]	On	—	Cisco recommends using AXSM port SCT 4 or 5.
		3[3]	Off	—	
		4	On	Off	PNNI policing on.
		5	Off	Off	PNNI policing off.

Table 7-1 Cisco Provided SCTs (continued)

Card Type	SCT Type	SCT ID	PNNI Policing[1]	MPLS Policing[1]	Notes
AXSM-E	Card[2]	4	N/A	N/A	All three AXSM-E card SCTs are identical.
		5	N/A	N/A	
		52	N/A	N/A	
	Port	4	On	Off	Use for UNI ports on interfaces faster than T1 or E1. There is no difference between port SCTs 4 and 5.
		5	On	Off	
		6	Off	Off	Use for NNI ports on interfaces faster than T1 or E1.
		52	On	Off	Use on AXSM-32-T1-E1-E UNI ports.
		53	Off	Off	Use on AXSM-32-T1-E1-E NNI ports.
		54	On	Off	Optimized for UNI IMA groups that use 4 T1/E1 lines or less.[4]
		55	Off	Off	Optimized for NNI IMA groups that use 4 T1/E1 lines or less.[4]
AXSM-XG	Card[2]	1	N/A	N/A	Optimized for an OC-192 backplane rate. Recommended for use in MGX 8950 switches.
		2	N/A	N/A	Optimized for an OC-48 backplane rate. Recommended for use in MGX 8850 switches.
	Port	100	Off	Off	Optimized for OC-192 interface path rates.
		101	Off	On	
		110	On	Off	
		111	On	On	
		200	Off	Off	Optimized for OC-48 interface path rates.
		201	Off	On	
		210	On	Off	
		211	On	On	
		300	Off	Off	Optimized for OC-12 interface path rates.
		301	Off	On	
		310	On	Off	
		311	On	On	
		400	Off	Off	Optimized for OC-3 interface path rates.
		401	Off	On	
		410	On	Off	
		411	On	On	
		500	Off	Off	Optimized for DS-3 interface path rates.
		501	Off	On	
		510	On	Off	
		511	On	On	

Table 7-1 Cisco Provided SCTs (continued)

Card Type	SCT Type	SCT ID	PNNI Policing[1]	MPLS Policing[1]	Notes
FRSM-12-T3E3	Card[2]	4	N/A	N/A	This is the only card SCT for this card.
	Port	4	On	On	This is the only port SCT for this card.
MPSM-T3E3-155	Card[2]	1	N/A	—	This is the only card SCT for this card.
	Port	1	On	—	Optimized for UNI connections that use 5 or more T1/E1 lines.
		2	Off	—	Optimized for NNI connections that use 5 or more T1/E1 lines.
		3	On	—	Optimized for IMA or MFR UNI connections that use 4 T1/E1 lines or less.
		4	Off	—	Optimized for IMA or MFR NNI connections that use 4 T1/E1 lines or less.
PXM1E	Port	5	On	Off	Use for UNI ports on interfaces faster than T1 or E1.
		6	Off	Off	Use for NNI ports on interfaces faster than T1 or E1.
		52	On	Off	Use for T1 and E1 UNI ports.
		53	Off	Off	Use for T1 and E1 NNI ports.
		54	On	Off	Optimized for UNI IMA groups that use 4 T1/E1 lines or less.[4]
		55	Off	Off	Optimized for NNI IMA groups that use 4 T1/E1 lines or less.[4]

1. Cisco recommends using SCTs with policing enabled for UNI ports and using SCTs with policing disabled for NNI ports.
2. Although policing card SCTs are provided for some service modules, the policing parameters are not used. All card SCTs are non-policing.
3. SCTs 2 and 3 were created when MGX switches supported PNNI only and were distributed with Release 2.0. These SCTs are provided for backward compatibility. Cisco recommends the use of SCTs that support PNNI and MPLS for all new installations and upgrades.
4. For IMA groups with 5-8 links, construct an SCT that uses 1/2 of the value of thresholds defined in SCTs 54 and 55. For IMA groups with 9-16 links, construct an SCT that uses 1/4 of the value of thresholds defined in SCTs 54 and 55.

Managing SCTs

Cisco MGX switches provide SCTs for PXM1E and for each service module type. The following sections describe the following tasks and topics for managing SCTs:

- Locating SCT Files on a Switch
- SCT File Naming Convention
- Creating and Modifying SCT Files
- Downloading SCT Files to the Switch
- Registering SCT Files
- Updating Registered SCT Files
- Deleting a Registered SCT
- Deleting Unregistered SCTs

Locating SCT Files on a Switch

SCT files are stored in two locations on a switch. Unregistered files are stored in the C:/SCT/TEMP directory, which is used to store unregistered files until they are registered using the CLI (as described later in this chapter) or CWM. You can use FTP to transfer files to this directory as described in the "Copying Software Files to the Switch" section in Appendix A, "Downloading and Installing Software Upgrades."

Registered files are stored in the F:/SCT directory. Switch administrators can view the contents of this directory for version management control purposes, but administrators are not allowed to copy files to this directory. To register files or to update files in this directory, you must use the CLI commands described in this chapter or use CWM as described in the *Cisco WAN Manager User's Guide, Release 15*.

SCT File Naming Convention

SCT file names use a name format that defines the file attributes in the following terms:

- Service module type supported
- SCT type (port or card) supported
- SCT ID for SCT selection
- Major version for the SCT file

The format for SCT file names is:

```
<service_module_type>_SCT.<PORT|CARD>.<SCT_ID>.V<major_version>
```

The following example shows a directory listing of SCT files:

```
M8850_SF.7.PXM.a > cd SCT/TEMP

M8850_SF.7.PXM.a > ll

Listing Directory .:
drwxrwxrwx  1 0       0            13312 Jun 17 21:35 ./
drwxrwxrwx  1 0       0            13312 Mar 11 23:38 ../
-rwxrwxrwx  1 0       0             9975 Jun 17 21:34 AXSME_SCT.CARD.5.V1
-rwxrwxrwx  1 0       0             9975 Jun 17 21:35 AXSME_SCT.PORT.5.V1
-rwxrwxrwx  1 0       0             9975 Jun 17 21:35 AXSME_SCT.PORT.6.V1
-rwxrwxrwx  1 0       0             7214 Jun 17 21:35 AXSM_SCT.CARD.2.V1
-rwxrwxrwx  1 0       0             7214 Jun 17 21:35 AXSM_SCT.CARD.3.V1
-rwxrwxrwx  1 0       0             9959 Jun 17 21:35 AXSM_SCT.CARD.4.V1
-rwxrwxrwx  1 0       0             9959 Jun 17 21:35 AXSM_SCT.CARD.5.V1
-rwxrwxrwx  1 0       0             7214 Jun 17 21:35 AXSM_SCT.PORT.2.V1
-rwxrwxrwx  1 0       0             7214 Jun 17 21:35 AXSM_SCT.PORT.3.V1
-rwxrwxrwx  1 0       0             9959 Jun 17 21:35 AXSM_SCT.PORT.4.V1
-rwxrwxrwx  1 0       0             9959 Jun 17 21:35 AXSM_SCT.PORT.5.V1
-rwxrwxrwx  1 0       0             8025 Jun 17 21:35 FRSM12_SCT.CARD.4.V1
-rwxrwxrwx  1 0       0             8025 Jun 17 21:35 FRSM12_SCT.CARD.5.V1
-rwxrwxrwx  1 0       0             8025 Jun 17 21:35 FRSM12_SCT.CARD.6.V1
-rwxrwxrwx  1 0       0             8025 Jun 17 21:35 FRSM12_SCT.CARD.7.V1
-rwxrwxrwx  1 0       0             8028 Jun 17 21:35 FRSM12_SCT.PORT.4.V1
-rwxrwxrwx  1 0       0             8025 Jun 17 21:35 FRSM12_SCT.PORT.5.V1
-rwxrwxrwx  1 0       0             8028 Jun 17 21:35 FRSM12_SCT.PORT.6.V1
-rwxrwxrwx  1 0       0             8028 Jun 17 21:35 FRSM12_SCT.PORT.7.V1

In the file system :
    total space :  818961 K bytes
    free  space :  672282 K bytes
```

Table 7-2 describes the parameters used in the SCT naming convention.

Table 7-2 SCT Naming Conventions

Parameter	Description
service_module_type	The type of the service module on which the SCT will be applied. The possible service module types are AXSM, AXSME, AXSMXG, FRSM12, MPSM155, and PXM1E.
PORT|CARD	Specifies whether this is a port SCT or a card SCT. **Note** PXM1E cards use port SCTs only. Card SCT s are not applicable to PXM1E cards.
SCT_ID	This decimal number identifies an SCT and is the number used to select a SCT when specifying a port or card SCT. The following SCT numbers indicate additional information: • 0 = Default SCT for the card type • 1-99 = Cisco provided SCTs which may be modified with CWM • 100 -255 = Custom SCTs created with CWM
V<*major_version*>	This decimal number identifies the major version of the SCT. The major version of the SCT changes whenever a new object is added or deprecated in the SCT MIB. Only Cisco can change the major version of an SCT. A minor version change occurs when an SCT is modified using CWM. Minor version numbers do not appear in the filename but they do appear in CWM and in the CLI after the SCT is registered. To see the minor version of registered SCTs, use the **dspscts** command.

Creating and Modifying SCT Files

SCT files can be created and modified using CWM as described in the *Cisco WAN Manager User's Guide, Release 15*. While there are no CLI commands for modifying SCT files, you can override SCT file settings for specific connections using CLI commands such as **cnfabr** and **cnfabrtparmdft**. If you need to modify multiple settings or multiple connections, it can be more efficient to modify SCTs with CWM.

Downloading SCT Files to the Switch

When you want to download a new or modified SCT file, you can download the file using CWM or by using an FTP program. If you have used CWM to create or modify an SCT or if you are using CWM to manage your SCTs, it is best to use CWM to download and to register the file. For more information, refer to the *Cisco WAN Manager User's Guide, Release 15*.

When using an FTP program, copy the files to the C:SCT/TEMP directory on the switch. For the latest information on Cisco provided SCTs, refer to the following release note documents:

- *Release Notes for Cisco MGX 8850 (PXM1E/PXM45), Cisco MGX 8950, and Cisco MGX 8830 Switches, Release 5.0.00*
- *Release Notes for the Cisco MGX 8880 Media Gateway, Release 5.0.00*

For more information on transferring files to the switch, see the "Copying Software Files to the Switch" section in Appendix A, "Downloading and Installing Software Upgrades."

After you download a file to a switch, you must register the SCT on the switch if it has not been registered before, or you must update a preregistered SCT. The next two sections describe how to register SCT files and how to update previously registered SCT files.

Registering SCT Files

SCT files must be registered on a switch before they can be used to configure card and port communications. The registration process checks for version conflicts and registers SCTs with CWM when CWM is used for network management.

The primary goal of SCT registration is to prevent the confusion that can result when two SCT files with the same name contain different configurations. Registration on a switch ensures that no two registered SCT files have the same name. When CWM is used to manage SCTs on a network, CWM can be used to prevent different configurations for the same file name within the network, and CWM can be used to distribute and register SCTs to multiple switches simultaneously. To learn how to manage SCT files with CWM, refer to the *Cisco WAN Manager User's Guide, Release 15*.

There are three types of registration:

- Auto registration during an upgrade
- Registration directed by CWM
- Manual registration initiated in the CLI

Autoregistration is used during upgrades from releases that did not support registered SCT files. Auto registration registers SCT files that were in use before the upgrade.

When an SCT is autoregistered or registered through CWM, there is no need to manually register the SCT. To view registered SCTs, use the **dspscts** command as described in "Displaying all Registered Card and Port SCTs on a Switch," which appears later in this chapter.

If the **dspscts** command display does not show the SCT you want to use, you can manually FTP an SCT file to the switch and then manually register that SCT. If the upgrade files are copied to the switch as described in the "Copying Software Files to the Switch" section in Appendix A, "Downloading and Installing Software Upgrades," you can manually register the SCT using the procedure described later in this section.

When you manually register an SCT, the SCT is moved from a temporary directory to the directory where registered SCTs are stored. You cannot use SCTs that are stored in the temporary directory. Once an SCT is registered, it is removed from the temporary directory so that it cannot be registered again.

Use the following procedure to manually register SCT files.

Step 1 Check the SCT temporary directory on the switch to see if the SCT file you want to register is available. The directory path is C:SCT/TEMP. For information on viewing directories, see the "Browsing the File System" section in Appendix A, "Downloading and Installing Software Upgrades."

Step 2 If the SCT file you want to register is not on the switch, FTP the SCT file to the C:SCT/TEMP folder, as described in the "Copying Software Files to the Switch" section in Appendix A, "Downloading and Installing Software Upgrades." For information on locating SCT files provided by Cisco, refer to the following release note documents:

- *Release Notes for Cisco MGX 8850 (PXM1E/PXM45), Cisco MGX 8950, and Cisco MGX 8830 Switches, Release 5.0.00*
- *Release Notes for the Cisco MGX 8880 Media Gateway, Release 5.0.00*

Step 3 Establish a CLI management session at any user access level.

Step 4 Obtain the checksum for the SCT file you are registering. You can look up the checksum in the release note documents listed in Step 2.

Note The checksum is calculated based on the file contents. If two files share the same name and define different configurations, the checksums will be different, and the registration process will detect the conflict. When you use a checksum displayed in the Release Notes for your product, successful registration verifies that the SCT is the same file that is distributed by Cisco. If registration with a Cisco supplied checksum is unsuccessful, the SCT you are trying to register has been modified.

Step 5 Register the SCT file using the **addsct** command and the checksum displayed in the previous step. The command format is:

```
D1.8.PXM.a > addsct <card type> <sct type> <sct id> <major ver> <checksum>
```

The required parameters identify the file name and the internal checksum and are defined in Table 7-3.

Table 7-3 addsct and cnfsct Command Parameters

Option	Description
card type	Identifies the type of card the SCT runs on. Enter one of the following: • AXSM = axsm or 1 • AXSME = axsme or 2 • AXSMXG = axsmxg or 5 • FRSM12 = frsm12 or 4 • MPSM-155-T3E3 = mpsm155 or 6 • PXM1E = pxm1e or 3
sct type	Defines the SCT type as one of the following: • Port SCT = 1 • Card SCT = 2 **Note** MGX 8850 (PXM1E) and MGX 8830 switches support only the PXM1E port SCTs.
sct id	Enter the SCT identification number, which appears in the file name.

Table 7-3 addsct and cnfsct Command Parameters (continued)

major ver	Enter the major version number of the SCT file as it appears in the filename. This number changes when a new parameter is added to a MIB. Only Cisco can generate a new major version of a file.
checksum	Enter the hexadecimal SCT checksum number published in one of the following documents: • *Release Notes for Cisco MGX 8850 (PXM1E/PXM45), Cisco MGX 8950, and Cisco MGX 8830 Switches, Release 5.0.00* • *Release Notes for the Cisco MGX 8880 Media Gateway, Release 5.0.00*

In the following example, FRSM card SCT 4, version 1, is registered on the switch.

```
M8850_SF.7.PXM.a > addsct frsm12 2 4 1 0x357d963a
```

You must enter this command once for each new SCT, or for each new major and minor version of a pre-existing SCT.

Step 6 Enter the **dspscts** command and verify that the SCT file is registered on your switch.

The status of the SCT would be marked as “failed” if the file does not exist or does not match the major and minor versions.

Updating Registered SCT Files

Once you have registered an SCT file on your switch, you can use the **cnfsct** command to update a registered SCT with a different major or minor version of the same SCT. To update a registered SCT, use the following procedure:

Step 1 FTP the new SCT file to the C:SCT/TEMP folder, as described in the “Copying Software Files to the Switch” section in Appendix A, “Downloading and Installing Software Upgrades.”

Step 2 Establish a configuration session at any user access level.

Step 3 Obtain the checksum for the SCT file you are registering. You can look up the checksum in the following release note documents:

- *Release Notes for Cisco MGX 8850 (PXM1E/PXM45), Cisco MGX 8950, and Cisco MGX 8830 Switches, Release 5.0.00*
- *Release Notes for the Cisco MGX 8880 Media Gateway, Release 5.0.00*

Note You will need the checksum for the **cnfsct** command in Step 4.

Step 4 Enter the **cnfsct** command at the active PXM switch prompt.

```
M8830_CH.2.PXM.a > cnfsct <card type> <sct type> <sct id> <major ver> <checksum>
```

The required parameters for this command are described in Table 7-3.

In the following example, the user overwrites and old MPSM card SCT with a new one:

```
M8830_CH.2.PXM.a > cnfsct mpsm155 1 2 1 0xbc8cd86c
The cnfsct command does not cause a new SCT to become active on the card type you specify
with this command. To activate the new SCT on an individual card,you must reset the
standby card in a redundant pair or the active card in a non-redundant configuration
Do you want to proceed (Yes/No) ? y
```

Step 5 Enter the **dspscts** command to ensure that the latest SCT version was registered on your switch. If the status is *valid*, the SCT is ready for use. The status of the SCT is marked as *failed* if the file does not exist or does not match the major and minor versions. If the checksum computed for the file does not match the checksum entered, the status is *checksum mismatch.*

Step 6 In order for the newer version of the SCT to take effect, you must reset each card that uses the SCT. The procedure is different for different card types and configurations. Select the procedure that applies to your situation from the following list:

- On a redundant pair of PXM1E cards or service modules, enter the **switchredcd** <*fromSlot*> <*toSlot*> command.
- On a standalone PXM1E card, enter the **resetcd** command.
- On a standalone service module, enter the **resetcd** <*slot*> command at the PXM prompt.

Step 7 To verify that the new card SCT version has been applied to the appropriate card, use the **cc** command to switch to that card, then enter the **dspcdsct** command.

Step 8 To verify that a new port SCT is in use on a card, use the **cc** command to switch to that card, then enter the **dspportsct gen** <*sctId*> command.

Applying a New Major Version of an AXSM SCT to a Card or Port

The major version number of an AXSM SCT file changes when a new parameter is added to an SCT, or when an existing parameter is deleted from an SCT. Only Cisco can warrant a major version change to an SCT file, and as of the publishing date of this guide, no major version updates have been released. Major version changes are posted in the *Release Notes for Cisco MGX 8850 (PXM1E/PXM45), Cisco MGX 8950, and Cisco MGX 8830 Switches, Release 5.0.00* and the *Release Notes for the Cisco MGX 8880 Media Gateway, Release 5.0.00*.

To apply a new major version of an SCT file to an AXSM card or port, use the following procedures:

Step 1 Download the new SCT file to your switch, as described in Appendix A, “Downloading and Installing Software Upgrades.”

Step 2 Establish a CLI management session at any user access level.

Step 3 Enter the **cc** command to change to the appropriate AXSM (the card on which you will apply the new SCT).

Step 4 Enter the **setsctver** <*sctver*> command. Replace <*sctver*> with the new SCT major version number.

```
M8850_SF.5.AXSM.a > setsctver 2
```

Step 5 In order for the newer version of the SCT to take effect, you must reset the card. On a redundant pair, enter the **switchredcd** command to reset the card. On a standalone card, enter the **resetcd** command.

Step 6 To verify that the new SCT version has been applied to the appropriate card, enter the **dspcd** command.

Step 7 To verify that a new port SCT is in use on a card, enter the **dspportsct gen** <*port*> command.

Deleting a Registered SCT

When you delete a registered SCT, the SCT is removed from the list of available SCTs and the switch. The SCT is no longer available to cards that match the SCT card type.

Note You cannot simply use the **addsct** command to add a previously deleted SCT. To add a previously deleted SCT, you must transfer the appropriate SCT file to the switch and then register the SCT.

To delete a registered SCT file from the switch, use the following procedure:

Step 1 Establish a CLI management session at any user access level.

Step 2 Enter the **dspscts** command to display the registered SCTs and the parameters you will need when deleting an SCT.

Step 3 At the PXM prompt, enter the **delsct** <*card type*> <*sct type*> <*sctid*> <*major ver*> command, as shown in the following example:

```
M8830_CH.2.PXM.a > delsct pxm1e 1 5 1
Warning: this SCT may be in use on the service modules or the PXM1E. Please verify SCT
usage on these cards by using the "dspports"
Do you want to proceed (Yes/No) ? y
```

Table 7-4 describes the parameters for the **delsct** command.

Table 7-4 delsct Command Parameters

Option	Description
card type	Identifies the type of card the SCT runs on. The possible card types are as follows: • AXSM = axsm or 1 • AXSME = axsme or 2 • AXSM-XG = axsmxg or 5 • FRSM-12-T3E3 = frsm12 or 4 • MPSM-T3E3-155 = mpsm155 or 6 • PXM1E = pxm1e or 3
sct type	Specifies whether the SCT is a port SCT or a card SCT.
sct id	Specifies the SCT ID number to be deleted.
major ver	Specifies the major version number of the SCT to be deleted.

Step 4 Enter the **dspscts** command to ensure that the proper SCT was deleted from your network.

Deleting Unregistered SCTs

Unregistered SCTs are stored as files in the temporary storage directory, C:SCT/TEMP/. Cisco recommends that you register all SCTs in this directory and delete any SCT files that you do not want to register. If you want to save SCT files that you do not want to register, Cisco recommends that you store these files on external media. Unregistered files that are in the temporary storage directory consume disk space and can create problems during software upgrades.

To navigate to the SCT temporary storage directory and make changes, use the commands described in the "Browsing the File System" section of Appendix A, "Downloading and Installing Software Upgrades."

Displaying all Registered Card and Port SCTs on a Switch

To display all registered SCTs on a switch and their status, enter the **dspscts** command at the active PXM switch prompt.

```
M8830_CH.2.PXM.a > dspscts
-----------------------------------------------------------------------------
 Card  Type   ID   Major Minor Checksum   Status   Description
-----------------------------------------------------------------------------
 PXM1E PORT  00005 00001 00000 0x53c67945  valid   cisco :PXM1E_SCT.PORT.5.V1
 PXM1E PORT  00006 00001 00000 0xb69ce935  valid   cisco :PXM1E_SCT.PORT.6.V1
 PXM1E PORT  00052 00001 00000 0x199550ec  valid   cisco :PXM1E_SCT.PORT.52.V1
 PXM1E PORT  00053 00001 00000 0xf6d53485  valid   cisco :PXM1E_SCT.PORT.53.V1
 PXM1E PORT  00054 00001 00000 0x2a96b5b9  valid   cisco :PXM1E_SCT.PORT.54.V1
 PXM1E PORT  00055 00001 00000 0x5403c5ac  valid   cisco :PXM1E_SCT.PORT.55.V1
MPSM155 PORT  00001 00001 00000 0x0fac7e45  valid   cisco :MPSM155_SCT.PORT.1.V1
MPSM155 CARD  00001 00001 00000 0x4c964664  valid   cisco :MPSM155_SCT.CARD.1.V1
MPSM155 CARD  00002 00001 00000 0xe0cbccd8  valid   cisco :MPSM155_SCT.CARD.2.V1
```

Table 7-5 describes the **dspscts** command display components.

Table 7-5 dspscts Command Display Components

Object	Description
card type	Type of Service Module to which the SCT is registered. Possible service modules are AXSM, AXSME, AXMS-XG, FRSM12, MPSM-155-T3E3, and PXM1E.
sct type	Describes whether the SCT is a port SCT or a card SCT.
sctid	A 16-bit number uniquely identifying the SCT.
major	A 16-bit number which identifies the major version of the SCT. When an object is deleted or added to an SCT MIB and an upgrade is required, the major version number of the file changes. The major version of a file is always in consecutive order and cannot be deleted.

Table 7-5 dspscts Command Display Components (continued)

Object	Description
minor	A 16-bit number which identifies the minor version of the SCT. Each time an SCT file is modified, saved, and downloaded, the minor version number changes. A minor version change does not require an upgrade or re-configuration of the card and port database. However, the card must be reset before the card can use the changed SCT settings. The minor version of a file can be deleted; therefore, the minor version number of a file may not be in consecutive order from the previous minor version of the same file.
checksum	An SCT identification number between 0 and 65535 that matches the checksum embedded in the SCT file. The checksum number for all new SCT files is advertised to the user through the *Release Notes for Cisco MGX 8850 (PXM1E/PXM45), Cisco MGX 8950, and Cisco MGX 8830 Switches, Release 5.0.00* and the *Release Notes for the Cisco MGX 8880 Media Gateway, Release 5.0.00*.
status	Status of the SCT file on the switch. The status of the SCT would be marked as "failed" if the file does not exist or does not match the major and minor versions.
description	Identifies whether the file is provided by Cisco and displays the source filename.

Managing Card SCTs

Card SCTs are used only on service modules. For instructions on managing card SCTs on service modules, refer to the service module documentation, which is listed in Table 1-1.

Managing PXM1E Port SCTs

The following sections describe how to manage PXM1E port SCTs using the following tasks:

- Displaying the SCT Assigned to a Port
- Selecting a Port SCT
- Changing a Port SCT
- Displaying Port SCT Settings

Note For instructions on managing port SCTs on service modules, refer to the service module documentation, which is listed in Table 1-1.

Displaying the SCT Assigned to a Port

To display the SCT assigned to a PXM1E port, use the following procedure.

Step 1 Establish a configuration session at any user access level.

Step 2 Enter the following command:

```
mgx8830a.1.PXM.a > dspports
```

The **dspports** report displays a column labeled "Port SCT Id," which identifies the SCT assigned to each port.

```
mgx8830a.1.PXM.a > dspports

ifNum Line Admin Oper. Guaranteed Maximum     Port SCT Id     ifType  VPI
           State State Rate       Rate                               (VNNI only)
----- ---- ----- ----- ---------- --------- ----------------- ------ ----------
    1  1.1    Up    Up    1412830   1412830   2                   NNI    0
    2  1.2    Up    Up    1412830   1412830   2                   NNI    0
    3  2.1    Up    Up    1412830   1412830   2                   NNI    0
```

Selecting a Port SCT

A port SCT defines queue parameters that apply to egress queues on a port. You can use the same port SCT for multiple ports. To select an SCT for a PXM1E port, enter the **addport** command as described in the "Adding ATM Ports" section in Chapter 3, "Provisioning PXM1E Communication Links."

Note An SCT must be registered before you can select it for a card or port. The exception to this requirement is the default SCT (SCT 0), which is permanently registered. For instructions on registering SCTs, see "Registering SCT Files," which appears earlier in this chapter.

Changing a Port SCT

To change the SCT assigned to a port, enter the **cnfport** command as described in the "Modifying ATM Ports" section in Chapter 3, "Provisioning PXM1E Communication Links."

Note An SCT must be registered before you can select it for a card or port. The exception to this requirement is the default SCT (SCT 0), which is permanently registered. For instructions on registering SCTs, see "Registering SCT Files," which appears earlier in this chapter.

Displaying Port SCT Settings

To view the port SCT settings, use the following procedure.

Step 1 Establish a CLI management session at any user access level.

Step 2 Enter the following command:

```
mgx8830a.1.PXM.a > dspportsct <abr|bw|gen|cosb|vcThr|cosThr> <ifNum>
```

Select one of the options to display one of the six SCT configuration reports, and replace <*ifNum*> with the number of the port you want to view. Table 7-6 describes the reports for each of these options.

Note The option names are case sensitive. The switch does not recognize the **vcthr** option. You must enter **vcThr**.

Table 7-6 Options for dspportsct Command

Option	Description
abr	Displays ABR parameters.
bw	Displays bandwidth and policing parameters.
gen	Displays general SCT parameters.
cosb	Displays COSB parameters.
vcThr	Displays virtual circuit threshold parameters.
cosThr	Displays COSB threshold parameters.

The SCT parameters are divided within SCT files into two groups: VC descriptors and COSB parameters. A COSB is special memory that temporarily stores incoming or outgoing connection data.

The sections that follow show the display for each of the **dspportsct** command options and describe the SCT parameters that appear in the display.

Port SCT ABR Parameters (dspportsct abr)

The following report appears when you enter the **dspportsct abr** command:

```
M8830_CH.1.PXM.a > dspportsct abr 1

Service Class Template [  6] : VC ABR Parameters
Major Version [  1]          : Minor Version [  0]
+-----------------------------------------------+
|    SERV TYPE    | CI CTRL |  VSVD   |
+-----------------------------------------------+
|  VSI_SIGNAL(  2)|DISABLED | DISABLED|
|   ATMF_CBR1(256)|DISABLED | DISABLED|
| ATMF_VBRrt1(257)|DISABLED | DISABLED|
| ATMF_VBRrt2(258)|DISABLED | DISABLED|
| ATMF_VBRrt3(259)|DISABLED | DISABLED|
|ATMF_VBRnrt1(260)|DISABLED | DISABLED|
|ATMF_VBRnrt2(261)|DISABLED | DISABLED|
|ATMF_VBRnrt3(262)|DISABLED | DISABLED|
|   ATMF_UBR1(263)|DISABLED | DISABLED|
|   ATMF_UBR2(264)|DISABLED | DISABLED|
|    ATMF_ABR(265)| ENABLED | DISABLED|
|   ATMF_CBR2(266)|DISABLED | DISABLED|
|   ATMF_CBR3(267)|DISABLED | DISABLED|
|    TAG_COS0(512)|DISABLED | DISABLED|
|    TAG_COS1(513)|DISABLED | DISABLED|
|    TAG_COS2(514)|DISABLED | DISABLED|
|    TAG_COS3(515)|DISABLED | DISABLED|
|    TAG_COS4(516)|DISABLED | DISABLED|
|    TAG_COS5(517)|DISABLED | DISABLED|
|    TAG_COS6(518)|DISABLED | DISABLED|
|    TAG_COS7(519)|DISABLED | DISABLED|
+-----------------------------------------------+
```

Table 7-7 describes the SCT ABR Parameters shown in the example.

Table 7-7 SCT ABR Descriptions

Parameter	Description
SERV-TYPE	The service type (for example, CBR, VBR, ABR) to which the parameters in this table apply (for example, COSB_NUM, CAC_TYPE, UPC_ENB).
CI CTRL	Congestion indicator (CI) control. When enabled, this parameter specifies that the CI field is an RM[1] cell that is used to cause the source to decrease the ACR. When an RM cell is sent, the source sets CI=1. When EFCI is received on a previous data cell, CI=1.
VSVD[2]	When enabled, this parameter divides an ABR connection into two or more separately controlled ABR segments. Each ABR control segment, except the first, is sourced by a virtual source. Sources and destinations are linked through bidirectional connections, and each connection termination point is both a source and a destination, a source for data that is transmitting, and a destination for data that is receiving.

1. RM = resource management
2. VSVD = virtual source/virtual destination

Port SCT Bandwidth Parameters (dspportsct bw)

The following report appears when you enter the **dspportsct bw** command:

```
M8830_CH.1.PXM.a > dspportsct bw 1

Service Class Template [  6] : Bw and Policing Parameters
Major Version [  1]          : Minor Version [  0]
+-----------------------------------------------------------+
| SERV-TYPE(DEC)  |   PCR   |   SCR   |   MCR   |   MBS   |
+-----------------------------------------------------------+
|  VSI_SIGNAL(  2)|    1000 |    1000 |    5000 |      50 |
|   ATMF_CBR1(256)|    1000 |    1000 |    5000 |     800 |
| ATMF_VBRrt1(257)|    1000 |    1000 |    5000 |      50 |
| ATMF_VBRrt2(258)|    1000 |    1000 |    5000 |      50 |
| ATMF_VBRrt3(259)|    1000 |    1000 |    5000 |      50 |
|ATMF_VBRnrt1(260)|    1000 |    1000 |    5000 |      50 |
|ATMF_VBRnrt2(261)|    1000 |    1000 |    5000 |      50 |
|ATMF_VBRnrt3(262)|    1000 |    1000 |    5000 |      50 |
|   ATMF_UBR1(263)|      10 |      10 |    5000 |     800 |
|   ATMF_UBR2(264)|      10 |      10 |    5000 |     800 |
|    ATMF_ABR(265)|      10 |      10 |       0 |      50 |
|   ATMF_CBR2(266)|    1000 |    1000 |    5000 |     800 |
|   ATMF_CBR3(267)|    1000 |    1000 |    5000 |     800 |
|    TAG_COS0(512)|    1000 |    1000 |    5000 |     800 |
|    TAG_COS1(513)|    1000 |    1000 |    5000 |     800 |
|    TAG_COS2(514)|    1000 |    1000 |    5000 |     800 |
|    TAG_COS3(515)|    1000 |    1000 |    5000 |     800 |
|    TAG_COS4(516)|    1000 |    1000 |    5000 |     800 |
|    TAG_COS5(517)|    1000 |    1000 |    5000 |     800 |
|    TAG_COS6(518)|    1000 |    1000 |    5000 |     800 |
|    TAG_COS7(519)|    1000 |    1000 |    5000 |     800 |
+-----------------------------------------------------------+
+-------------------------------------------------+
| SERV-TYPE(DEC)  | CDVT    |   ICR   |   MFS   |
+-------------------------------------------------+
|  VSI_SIGNAL(  2)| 250000  |     100 |     100 |
|   ATMF_CBR1(256)| 250000  |     100 |     100 |
| ATMF_VBRrt1(257)| 250000  |     100 |     100 |
| ATMF_VBRrt2(258)| 250000  |     100 |     100 |
| ATMF_VBRrt3(259)| 250000  |     100 |     100 |
|ATMF_VBRnrt1(260)| 250000  |     100 |     100 |
|ATMF_VBRnrt2(261)| 250000  |     100 |     100 |
|ATMF_VBRnrt3(262)| 250000  |     100 |     100 |
|   ATMF_UBR1(263)| 250000  |     100 |     100 |
|   ATMF_UBR2(264)| 250000  |     100 |     100 |
|    ATMF_ABR(265)| 250000  |       0 |     100 |
|   ATMF_CBR2(266)| 250000  |     100 |     100 |
|   ATMF_CBR3(267)| 250000  |     100 |     100 |
|    TAG_COS0(512)| 250000  |     100 |     100 |
|    TAG_COS1(513)| 250000  |     100 |     100 |
|    TAG_COS2(514)| 250000  |     100 |     100 |
|    TAG_COS3(515)| 250000  |     100 |     100 |
|    TAG_COS4(516)| 250000  |     100 |     100 |
|    TAG_COS5(517)| 250000  |     100 |     100 |
|    TAG_COS6(518)| 250000  |     100 |     100 |
|    TAG_COS7(519)| 250000  |     100 |     100 |
+-------------------------------------------------+
```

Table 7-8 describes the SCT ABR Parameters shown in the example.

Table 7-8 SCT Bandwidth Parameter Descriptions

Parameter	Description
SERV-TYPE	The service type (for example, CBR, VBR, ABR) to which the parameters in this table apply (for example, COSB_NUM, CAC_TYPE, UPC_ENB).
PCR	Specifies the maximum PCR for a connection using this service type. The value is a percentage of the maximum cell rate for the logical interface. 1000000 is equal to 100%. The range and units are 0 to 1000000.
SCR	Specifies the SCR[1] for a connection using this service type. The value is a percentage of the maximum cell rate for the logical interface. 1000000 is equal to 100%. The range and units are from 0 to 1000000.
MCR	Specifies the MCR[2] for a connection using this service type. The value is a percentage of the maximum cell rate for the logical interface. 1000000 is equal to 100%. The range and units are from 0 to 1000000.
MBS	Specifies the maximum number of cells that can arrive at a rate equal to the PCR. The MBS[3] is used for policing. The range and units are from 1 to 5000000.
CDVT	Specifies the CDVT[4] for the first leaky bucket.
ICR	Specifies the ICR[5] for a transmission on a connection that has been idle for a configured period of time. The value is a percentage of the PCR for the logical interface. 1000000 is equal to 100%. **Note** ABR service type connections are used only. The range and units are from 0 to 1000000.
MFS	Specifies the AAL5 MFS[6] in cells.

1. SCR = sustained cell rate
2. MCR = minimum cell rate
3. MBS = maximum burst size
4. CDVT = cell delay variation tolerance
5. ICR = initial cell rate
6. MFS = maximum frame size

Port SCT General Parameters (dspportsct gen)

The following report appears when you enter the **dspportsct gen** command:

```
M8830_CH.1.PXM.a > dspportsct gen 1

Service Class Template [  6] : General Parameters
Major Version [  1]          : Minor Version [  0]
+-----------------------------------------------------------+
| SERV-TYPE(DEC)   | COSB_NUM | CAC_TYPE |  UPC_ENB    | WFQ_ENB   |
+-----------------------------------------------------------+
|  VSI_SIGNAL(  2)|       1    |      BCAC | DISABLED    | DISABLED |
|   ATMF_CBR1(256)|       4    |      BCAC | DISABLED    | DISABLED |
| ATMF_VBRrt1(257)|       5    |      BCAC | DISABLED    | DISABLED |
| ATMF_VBRrt2(258)|       5    |      BCAC | DISABLED    | DISABLED |
| ATMF_VBRrt3(259)|       5    |      BCAC | DISABLED    | DISABLED |
|ATMF_VBRnrt1(260)|       6    |      BCAC | DISABLED    | DISABLED |
|ATMF_VBRnrt2(261)|       6    |      BCAC | DISABLED    | DISABLED |
|ATMF_VBRnrt3(262)|       6    |      BCAC | DISABLED    | DISABLED |
|   ATMF_UBR1(263)|       7    |   LCN_CAC | DISABLED    | DISABLED |
|   ATMF_UBR2(264)|       7    |   LCN_CAC | DISABLED    | DISABLED |
|    ATMF_ABR(265)|       2    |      BCAC | DISABLED    | DISABLED |
|   ATMF_CBR2(266)|       4    |      BCAC | DISABLED    | DISABLED |
|   ATMF_CBR3(267)|       4    |      BCAC | DISABLED    | DISABLED |
|    TAG_COS0(512)|       8    |   LCN_CAC | DISABLED    | DISABLED |
|    TAG_COS1(513)|       9    |   LCN_CAC | DISABLED    | DISABLED |
|    TAG_COS2(514)|      10    |   LCN_CAC | DISABLED    | DISABLED |
|    TAG_COS3(515)|      11    |   LCN_CAC | DISABLED    | DISABLED |
|    TAG_COS4(516)|       8    |   LCN_CAC | DISABLED    | DISABLED |
|    TAG_COS5(517)|       9    |   LCN_CAC | DISABLED    | DISABLED |
|    TAG_COS6(518)|      10    |   LCN_CAC | DISABLED    | DISABLED |
|    TAG_COS7(519)|      11    |   LCN_CAC | DISABLED    | DISABLED |
+-----------------------------------------------------------+
+-----------------------------------------------------------------+
| SERV-TYPE(DEC)   |  UPC_SELECT  |    GCRA1_PLCY     |    GCRA2_PLCY    |
|                  |  BKT1_BKT2   |                   |                  |
+-----------------------------------------------------------------+
|  VSI_SIGNAL(  2)|   CLP01_CLP01|          DISCARD|          DISCARD|
|   ATMF_CBR1(256)|    CLP01_DISC|          DISCARD|          DISCARD|
| ATMF_VBRrt1(257)|   CLP01_CLP01|          DISCARD|          DISCARD|
| ATMF_VBRrt2(258)|    CLP01_CLP0|          DISCARD|          DISCARD|
| ATMF_VBRrt3(259)|    CLP01_CLP0|          DISCARD|          SET_CLP|
|ATMF_VBRnrt1(260)|   CLP01_CLP01|          DISCARD|          DISCARD|
|ATMF_VBRnrt2(261)|    CLP01_CLP0|          DISCARD|          DISCARD|
|ATMF_VBRnrt3(262)|    CLP01_CLP0|          DISCARD|          SET_CLP|
|   ATMF_UBR1(263)|    CLP01_DISC|          DISCARD|          DISCARD|
|   ATMF_UBR2(264)|    CLP01_DISC|SET_CLP_DISC_TAGD|          DISCARD|
|    ATMF_ABR(265)|    CLP01_DISC|          DISCARD|          DISCARD|
|   ATMF_CBR2(266)|    CLP01_DISC|          DISCARD|          DISCARD|
|   ATMF_CBR3(267)|    CLP01_CLP0|          DISCARD|          DISCARD|
|    TAG_COS0(512)|    CLP01_CLP0|          DISCARD|          DISCARD|
|    TAG_COS1(513)|    CLP01_CLP0|          DISCARD|          DISCARD|
|    TAG_COS2(514)|    CLP01_CLP0|          DISCARD|          DISCARD|
|    TAG_COS3(515)|    CLP01_CLP0|          DISCARD|          DISCARD|
|    TAG_COS4(516)|    CLP01_CLP0|          DISCARD|          DISCARD|
|    TAG_COS5(517)|    CLP01_CLP0|          DISCARD|          DISCARD|
|    TAG_COS6(518)|    CLP01_CLP0|          DISCARD|          DISCARD|
|    TAG_COS7(519)|    CLP01_CLP0|          DISCARD|          DISCARD|
+-----------------------------------------------------------------+
```

Table 7-9 describes the SCT General Parameters shown in the example.

Table 7-9 SCT General Parameter Descriptions

Parameter	Description
SERV-TYPE	The service type (for example, CBR, VBR, ABR) to which the parameters in this table apply (for example, COSB_NUM, CAC_TYPE, UPC_ENB).
COSB_NUM	Class of Service Buffer Number. The number that identifies one of the sixteen CoS buffers. A CoS buffer is a buffer that services connections with similar QoS requirements.
CAC_TYPE	Connection Admission Control. Used by an ATM switch during setup to determine if a connection requested QoS conforms to the guaranteed QoS standards for ATM connections. LCN_CAC = Logical Connection Number CAC B_CAC = Basic - CAC E_CAC = Enhanced - CAC
UPC_ENB	Usage Parameter Control Enable. This parameter shows whether UPC is enabled or disabled for the specified service type.
WFQ_ENB	Weighted Fair Queuing Enable. This parameter shows whether WFQ is enabled or disabled for the specified service type.
UPC_SELECT BKT1_BKT2	UPC selection for buckets 1 and 2. Specifies whether each bucket will police for CLP (0+1) or CLP (0) in the dual leaky bucket policing action. The following parameter values may be displayed: • CLP01_CLP0 = Bucket 1: CLP (0+1), Bucket 2: CLP (0) • CLP01_CLP01 = Bucket 1: CLP (0+1), Bucket 2: CLP (0+1) • CLP01_DISC = Bucket 1: CLP (0+1), Bucket 2: Disabled • ? = Bucket 1: CLP (0+1) with Maximum Frame Size (MFS)

Table 7-9 SCT General Parameter Descriptions (continued)

Parameter	Description
GCRA1_PLCY	Generic Cell Rate Algorithm – Bucket 1 policy. **Note** If UPC-Enable is set to disabled, the configured policy is ignored and no cells are discarded or tagged. The following parameter values indicate how cells that fail the first bucket of the policer are handled: • DISCARD = Discard cell • SET_CLP = Set CLP bit in cell • SET_CLP_DISC_TAGD = Set CLP of untagged cells, discard tagged cells.
GCRA2_PLCY	Generic Cell Rate Algorithm – Bucket 2 policy. **Note** If UPC-Enable is set to disabled, the configured policy is ignored and no cells are discarded or tagged. The following parameter values indicate how cells that fail the second bucket of the policer are handled: • DISCARD = Discard cell • SET_CLP = Set CLP bit in cell • SET_CLP_DISC_TAGD = Set CLP of untagged cells, discard tagged cells.

Port SCT COSB Parameters (dspportsct cosb)

The following report appears when you enter the **dspportsct cosb** command:

```
M8830_CH.1.PXM.a > dspportsct cosb 1
+-------------------------------------------------------------+
| Service Class Template [  6] : COSB Parameters              |
| Major Version [  1]          : Minor Version [  0]          |
+-------------------------------------------------------------+
|COSB| MIN-RATE| MAX-RATE| EXCESS | CELL DISC |    ERS     |CLR|
|NUM |         |         |PRIORITY| ALARM     |            |   |
+-------------------------------------------------------------+
|  1 |       0 | 1000000 |      0 | DISABLED  | DISABLED   |  6|
|  2 |       0 | 1000000 |      2 | DISABLED  | DISABLED   |  6|
|  3 |       0 | 1000000 |      2 | DISABLED  | DISABLED   |  6|
|  4 |       0 | 1000000 |      0 | DISABLED  | DISABLED   | 10|
|  5 |       0 | 1000000 |      1 | DISABLED  | DISABLED   |  8|
|  6 |       0 | 1000000 |      1 | DISABLED  | DISABLED   |  6|
|  7 |       0 | 1000000 |      2 | DISABLED  | DISABLED   |  6|
|  8 |       0 | 1000000 |      2 | DISABLED  | DISABLED   |  6|
|  9 |       0 | 1000000 |      2 | DISABLED  | DISABLED   |  6|
| 10 |       0 | 1000000 |      2 | DISABLED  | DISABLED   |  6|
| 11 |       0 | 1000000 |      2 | DISABLED  | DISABLED   |  6|
| 12 |       0 | 1000000 |      2 | DISABLED  | DISABLED   |  6|
| 13 |       0 |  100000 |      2 | DISABLED  | DISABLED   |  6|
| 14 |       0 |  100000 |      2 | DISABLED  | DISABLED   |  6|
| 15 |       6 | 1000000 |      2 | DISABLED  | DISABLED   |  6|
| 16 |       0 | 1000000 |      0 | DISABLED  | DISABLED   |  6|
+------------------------------------------------------------+
```

Table 7-10 describes the SCT COSB parameters shown in the example.

Table 7-10 SCT COSB Parameter Descriptions

Label	Range and Units	Description
COSB	N.A.	COSB number.
MIN-RATE	1–1000000	This field is no longer used and is currently always set to its default value (0).
MAX-RATE	1–1000000	This field is no longer used and is currently always set to its default value (100).
EXCESS-PRIORITY	0–15	The priority at which this COSB will be given access to excess bandwidth. • 0 is highest priority • 15 is lowest priority
CELL DISC ALARM		Indicates whether the cell discard alarm is enabled or disabled.
ERS[1]		Indicates whether ERS is enabled or disabled.
CLR	1–15	Cell Loss Ratio for this COSB. The minimum supported CLR is 10^{-6} and maximum supported CLR is 10^{-10}

1. ERS = Explicit Rate Stamping

Port SCT Virtual Circuit Threshold Parameters (dspportsct vcThr)

The following report appears when you enter the **dspportsct vcThr** command:

```
M8830_CH.1.PXM.a > dspportsct vcThr 1

Service Class Template [  6] : VC Threshold Parameters
Major Version [  1]          : Minor Version [  0]
+-----------------------------------------------------------+
|  SERV TYPE(DEC) | MAX_CELL  |   EFCI   | CLPlo/EPD|   CLPhi  |
|                 | THR(cells)|  (cells) | (cells)  |  (cells) |
+-----------------------------------------------------------+
|  VSI_SIGNAL(  2)|      359  |      359 |      143 |      287 |
|   ATMF_CBR1(256)|       35  |       35 |       14 |       28 |
| ATMF_VBRrt1(257)|       71  |       71 |       28 |       56 |
| ATMF_VBRrt2(258)|       71  |       71 |       28 |       56 |
| ATMF_VBRrt3(259)|       71  |       71 |       28 |       56 |
|ATMF_VBRnrt1(260)|      359  |      359 |      143 |      287 |
|ATMF_VBRnrt2(261)|      359  |      359 |      143 |      287 |
|ATMF_VBRnrt3(262)|      359  |      359 |      143 |      287 |
|   ATMF_UBR1(263)|      718  |      718 |      287 |      574 |
|   ATMF_UBR2(264)|      718  |      718 |      287 |      574 |
|    ATMF_ABR(265)|      718  |      143 |      287 |      574 |
|   ATMF_CBR2(266)|       35  |       35 |       14 |       28 |
|   ATMF_CBR3(267)|       35  |       35 |       14 |       28 |
|    TAG_COS0(512)|      718  |      718 |      287 |      574 |
|    TAG_COS1(513)|      718  |      718 |      287 |      574 |
|    TAG_COS2(514)|      718  |      718 |      287 |      574 |
|    TAG_COS3(515)|      718  |      718 |      287 |      574 |
|    TAG_COS4(516)|      718  |      718 |      287 |      574 |
|    TAG_COS5(517)|      718  |      718 |      287 |      574 |
|    TAG_COS6(518)|      718  |      718 |      287 |      574 |
|    TAG_COS7(519)|      718  |      718 |      287 |      574 |
+----------------------------------------+
```

```
|  SERV TYPE(DEC)  | SCALING |PKT DISCARD|
|                  |  CLASS  |   ENABLE  |
+--------------------------------------+
|  VSI_SIGNAL(  2)|     2   |  DISABLED |
|   ATMF_CBR1(256)|     1   |  DISABLED |
| ATMF_VBRrt1(257)|     2   |  DISABLED |
| ATMF_VBRrt2(258)|     2   |  DISABLED |
| ATMF_VBRrt3(259)|     2   |  DISABLED |
|ATMF_VBRnrt1(260)|     2   |  DISABLED |
|ATMF_VBRnrt2(261)|     2   |  DISABLED |
|ATMF_VBRnrt3(262)|     2   |  DISABLED |
|   ATMF_UBR1(263)|     4   |  DISABLED |
|   ATMF_UBR2(264)|     4   |  DISABLED |
|    ATMF_ABR(265)|     3   |  DISABLED |
|   ATMF_CBR2(266)|     1   |  DISABLED |
|   ATMF_CBR3(267)|     1   |  DISABLED |
|    TAG_COS0(512)|     4   |   ENABLED |
|    TAG_COS1(513)|     4   |   ENABLED |
|    TAG_COS2(514)|     4   |   ENABLED |
|    TAG_COS3(515)|     4   |   ENABLED |
|    TAG_COS4(516)|     4   |   ENABLED |
|    TAG_COS5(517)|     4   |   ENABLED |
|    TAG_COS6(518)|     4   |   ENABLED |
|    TAG_COS7(519)|     4   |   ENABLED |
+--------------------------------------+
```

Table 7-11 describes the SCT VC Threshold parameters shown in the example.

Table 7-11 SCT VC Threshold Parameter Descriptions

Label	Description
SERV-TYPE	The service type (for example, CBR, VBR, ABR) to which the parameters (for example, EFCI, CLP_HI, EPD0) in this table apply.
MAX_CELL	The VcMax threshold for CLP (0+1) cells in cells.
EFCI	Explicit Forward Congestion Indication. The VC EFCI discard threshold in cells.
CLP_LO /EPD1	Cells Loss Priority Low / Early Packet Discard 1. The low hysteresis threshold, in cells, at which CLP (1) cells will stop being discarded. If packet mode is enabled, EPD1 executes.
CLP_HI	Cells Loss Priority - High. The high hysteresis threshold, in cells, at which CLP (1) cells will be discarded. The cells will continue to be discarded until the CLP_LO threshold is reached.
EPD0	Early Packet Discard 0. The maximum threshold, in cells, for CLP (0+1) cells.
SCALING CLASS	Class of Service Scaling Class. Indicates which of the four Scaling Class Tables (see Table 7-12, 1–4) to use for a connection. Each table is for a specific service category and has an index of 16 entries. Each index entry contains a percentage by which to scale traffic on a connection to reduce CoS buffer congestion. The hardware generates the index and selects the entries as needed. Each entry is the ratio of the COSB cell count to the COSB maximum threshold. CoS scaling occurs when the CoSB cell count is approximately 50% of the CoSB max threshold.

Table 7-11 SCT VC Threshold Parameter Descriptions (continued)

Label	Description
SCALING CLASS	Logical Port Scaling Class. Indicates which of the four Scaling Class Tables (see Table 7-13, 1–4) to use on a logical port. Each table is for a specific service category and has an index of 16 entries. Each index entry contains a percentage by which to scale traffic on a connection on a logical port to reduce congestion. The hardware generates the index and selects the entries as needed. Each entry is the ratio of the interface cell count to the interface maximum threshold. Interface scaling occurs when the interface cell count is approximately 50% of the interface max threshold.
PKT DISCARD ENABLE	Shows whether packet discard is enabled or disabled for the service type.

Table 7-12 Class of Service (CoS) Scaling Table

Index	Scaling Class Table #1 (CBR)	Scaling Class Table #2 (VBR)	Scaling Class Table #3 (ABR)	Scaling Class Table #4 (UBR)
0	100.00%	100.00%	100.00%	100.00%
1	100.00%	100.00%	100.00%	100.00%
2	100.00%	100.00%	100.00%	100.00%
3	100.00%	100.00%	100.00%	100.00%
4	100.00%	100.00%	100.00%	100.00%
5	100.00%	100.00%	100.00%	100.00%
6	100.00%	100.00%	100.00%	67.00%
7	100.00%	100.00%	100.00%	34.00%
8	100.00%	100.00%	50.00%	20.00%
9	100.00%	50.00%	25.00%	12.00%
10	100.00%	25.00%	12.00%	8.00%
11	100.00%	12.00%	6.00%	4.00%
12	100.00%	6.00%	3.00%	2.50%
13	100.00%	3.00%	1.30%	1.40%
14	100.00%	1.30%	0.75%	1.00%
15	100.00%	0.50%	0.50%	0.50%

Table 7-13 Logical Interface Scaling Table

Index	Scaling Class Table #1 (CBR)	Scaling Class Table #2 (VBR)	Scaling Class Table #3 (ABR)	Scaling Class Table #4 (UBR)
0	100.00%	100.00%	100.00%	100.00%
1	100.00%	100.00%	100.00%	100.00%
2	100.00%	100.00%	100.00%	100.00%

Table 7-13 Logical Interface Scaling Table (continued)

Index	Scaling Class Table #1 (CBR)	Scaling Class Table #2 (VBR)	Scaling Class Table #3 (ABR)	Scaling Class Table #4 (UBR)
3	100.00%	100.00%	100.00%	100.00%
4	100.00%	100.00%	100.00%	100.00%
5	100.00%	100.00%	100.00%	100.00%
6	100.00%	100.00%	100.00%	67.00%
7	100.00%	100.00%	100.00%	34.00%
8	100.00%	100.00%	50.00%	20.00%
9	100.00%	50.00%	25.00%	12.00%
10	100.00%	25.00%	12.00%	8.00%
11	100.00%	12.00%	6.00%	4.00%
12	50.00%	6.00%	3.00%	2.50%
13	25.00%	3.00%	1.30%	1.40%
14	6.00%	1.30%	0.75%	1.00%
15	0.50%	0.50%	0.50%	0.50%

Port SCT COSB Threshold Parameters (dspportsct cosThr)

The following report appears when you enter the **dspportsct cosThr** command:

```
M8830_CH.1.PXM.a > dspportsct cosThr 1
+-----------------------------------------------------------+
| Service Class Template [  6] : COSB Threshold Parameters |
| Major Version [  1]          : Minor Version [  0]        |
+-----------------------------------------------------------+
|COSB| MAX_THR  |   EFCI   | CLPlo/EPD1|  CLPhi    |   EPD0   | DISC_ALM  |
|    | (cells)  | (cells)  |  (cells)  |  (cells)  |  (cells) |THR(cells) |
+-----------------------------------------------------------+
|  1 |      718 |      718 |      430  |       610 |      502 |       15  |
|  2 |     1436 |      287 |      861  |      1220 |     1005 |       15  |
|  3 |     4310 |     4310 |     2586  |      3663 |     3017 |        2  |
|  4 |       71 |       71 |       42  |        60 |       49 |       15  |
|  5 |      143 |      143 |       85  |       121 |      100 |       15  |
|  6 |      718 |      718 |      430  |       610 |      502 |       15  |
|  7 |     1436 |     1436 |      861  |      1220 |     1005 |       15  |
|  8 |     4310 |     4310 |     2586  |      3663 |     3017 |       15  |
|  9 |     4310 |     4310 |     2586  |      3663 |     3017 |       15  |
| 10 |     4310 |     4310 |     2586  |      3663 |     3017 |       15  |
| 11 |     1436 |     1436 |      861  |      1220 |     1005 |      900  |
| 12 |      718 |      718 |      430  |       610 |      502 |      900  |
| 13 |     1436 |     1436 |      861  |      1220 |     1005 |      900  |
| 14 |     1436 |     1436 |      861  |      1220 |     1005 |      900  |
| 15 |      574 |      574 |      344  |       487 |      401 |        2  |
| 16 |      718 |      718 |      430  |       610 |      502 |        2  |
+-----------------------------------------------------------+
```

Table 7-14 describes the SCT COSB threshold parameters shown in the example.

Table 7-14 SCT COSB Threshold Parameter Descriptions

Label	Description
COSB	COSB number.
MAX_THR	The maximum threshold, in cells, beyond which all CLP (0+1) cells must be dropped.
EFCI	Explicit Forward Congestion Indication. The threshold level, in cells, for congestion indication for ABR traffic using CI control.
CLP_LO /EPD1	Cell Loss Priority Low/ Early Packet Discard 1. The threshold in cells at which CLP (0+1) cells that exceed this threshold are discarded.
CLP_HI	Cells Loss Priority High. The maximum number of cells that can be queued in the buffer. CLP (1) cells that exceed this threshold are discarded.
EPD0	Early Packet Discard 0. The maximum number of cells that can be queued in the buffer in packet mode. Any CLP (0+1) cells that exceed this threshold, will be discarded.
DISC_ALM THR	

CHAPTER 8

Managing PNNI Nodes and PNNI Routing

This chapter provides procedures that you can use to manage Private Network-to-Network Interface (PNNI) nodes and routes. This chapter includes the following sections:

- Managing PNNI Nodes
- Managing PNNI Routes
- Displaying Node Configuration Information
- Managing CUGs
- Maintaining a Persistent Network Topology for CWM

Note The concepts behind the procedures in this chapter are introduced in the *Cisco PNNI Network Planning Guide for MGX and SES Products*.

Managing PNNI Nodes

The following sections describe how to configure upper level peer groups and how to manage the PNNI node.

Creating Upper Level Peer Groups

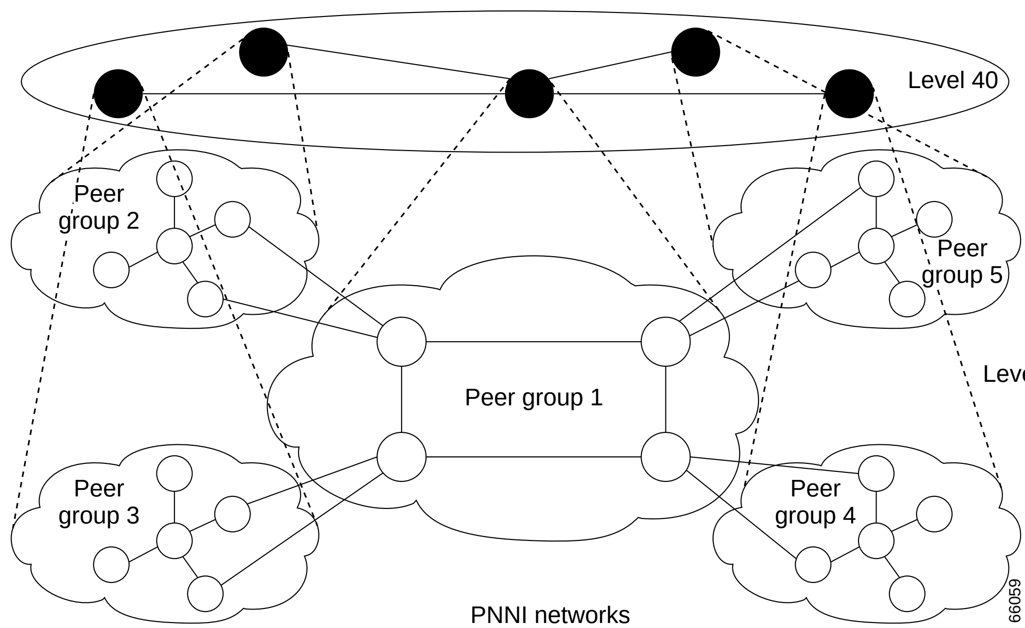
Upper level peer groups enable routing from one PNNI peer group to another. If you are managing a single peer group WAN, you do not need to create upper level peer groups.

Note The "Configuring PNNI Node Parameters" section in Chapter 2, "Configuring General Switch Features," describes how to configure the lowest level peer group parameters, which many upper level peer group parameters are based on. You should configure the basic PNNI node parameters before creating upper level peer groups.

After you configure the lowest level PNNI nodes, all nodes within the same peer group can communicate with each other. All you need to do to enable communications between two nodes in a peer group is to add a PNNI trunk between them as described in the "ATM Trunk Configuration Quickstart" section in Chapter 3, "Provisioning PXM1E Communication Links." To enable routing between different peer groups at the same level, you must create one or more upper level peer groups.

The actual procedure for creating an upper level peer group for your WAN depends on the structure of your WAN. This section shows how to create an upper level peer group for the WAN shown in Figure 8-1.

Figure 8-1 Example Hierarchical PNNI Network Topology Showing a Two-Level Hierarchy



In Figure 8-1, the five level-56 peer groups are isolated from each other until the upper level peer group is created. The members of the upper level peer group are the peer group leaders from the lower level peer groups. To create an upper level peer group, you need to configure the peer group leaders and add the upper level PNNI process to each peer group leader (PGL) node. It is also a good practice to configure secondary peer group leaders that can take over if a PGL fails.

To configure peer group leaders, use the following procedure.

Step 1 Establish a configuration session using a user name with SUPER_GP privileges or higher.

Add the upper level PNNI logical node that will participate in the higher level PNNI group using the **addpnni-node** <*level*> command.

Replace level with the PNNI level for the higher level peer group. The PNNI level value must be smaller than the level value for the lower level peer groups. The following example creates a logical PNNI node at PNNI level 40.

```
PXM1E_SJ.7.PXM.a > addpnni-node 40
```

Note You need to complete this step for all nodes that will serve as PGLs or backup PGLs.

Step 2 Display the current PGL priority of the node that will become PGL or a back up PGL by entering the **dsppnni-election** command as shown in the following example:

```
PXM1E_SJ.7.PXM.a > dsppnni-election

node index: 1
   PGL state......      OperNotPgl     Init time(sec).......        15
   Priority.......               0     Override delay(sec)..        30
                                       Re-election time(sec)        15
   Pref PGL...............56:160:47.00918100000000036b5e31b3.00036b5e31b3.01
   Pref PGL node name .....M8850_NY
   PGL....................56:160:47.00918100000000036b5e31b3.00036b5e31b3.01
   PGL node name .........M8850_NY
   Active parent node id...0:0:00.000000000000000000000000.000000000000.00
   Active parent node name



node index: 2
   PGL state......        Starting     Init time(sec).......        15
   Priority.......               0     Override delay(sec)..        30
                                       Re-election time(sec)        15
   Pref PGL...............0:0:00.000000000000000000000000.000000000000.00
   Pref PGL node name .....
   PGL....................0:0:00.000000000000000000000000.000000000000.00
   PGL node name .........
   Active parent node id...0:0:00.000000000000000000000000.000000000000.00
   Active parent node name
```

In the example above, the PGL state indicates the PGL status of each of two logical nodes, and the priority value is what is used to determine if the node will become PGL. In this example, both logical nodes are set to the default value 0, and this value prevents a node from becoming a peer group leader.

Step 3 Set the PNNI priority for the node with the **cnfpnni-election** command as follows:

```
mgx8830a.1.PXM.a > cnfpnni-election node-index -priority value
```

Replace *node-index* with the index that identifies the logical node you are modifying, and replace *value* with the new priority value. A zero value prevents the node from becoming a PGL. If only one node in a peer group has a non-zero priority, that node will become PGL. If multiple nodes have non-zero priority values, the node with the highest priority value becomes PGL. The following example shows what happens after you set the priority level and view the PGL status.

```
PXM1E_SJ.7.PXM.a > cnfpnni-election 1 -priority 200

PXM1E_SJ.7.PXM.a > dsppnni-election

node index: 1
   PGL state......  AwaitUnanimity     Init time(sec).......        15
   Priority.......             200     Override delay(sec)..        30
                                       Re-election time(sec)        15
   Pref PGL...............56:160:47.00918100000000001a533377.00001a533377.01
   Pref PGL node name .....PXM1E_SJ
   PGL....................56:160:47.00918100000000036b5e31b3.00036b5e31b3.01
   PGL node name .........M8850_NY
   Active parent node id...0:0:00.000000000000000000000000.000000000000.00
   Active parent node name
```

```
node index: 2
   PGL state......        Starting     Init time(sec).......        15
   Priority.......               0     Override delay(sec)..        30
                                       Re-election time(sec)        15
   Pref PGL................0:0:00.000000000000000000000000.000000000000.00
   Pref PGL node name .....
   PGL.....................0:0:00.000000000000000000000000.000000000000.00
   PGL node name ..........
   Active parent node id...0:0:00.000000000000000000000000.000000000000.00
   Active parent node name
```

The first time the **dsppnni-election** command was entered, the PGL state was OperNotPgl, which means that the node is operating, but is not operating as a PGL. After the priority is changed, the PGL state changes to AwaitUnanimity, which means the node is communicating with the other nodes in its peer group to see if it has the highest priority and should be PGL. If you enter the **dsppnni-election** command again after about 15 seconds, the PGL state changes as shown in the following example:

```
PXM1E_SJ.7.PXM.a > dsppnni-election

node index: 1
   PGL state......         OperPgl     Init time(sec).......        15
   Priority.......             250     Override delay(sec)..        30
                                       Re-election time(sec)        15
   Pref PGL................56:160:47.00918100000000001a533377.00001a533377.01
   Pref PGL node name .....PXM1E_SJ
   PGL.....................56:160:47.00918100000000001a533377.00001a533377.01
   PGL node name ..........PXM1E_SJ
   Active parent node id...40:56:47.00918100000000000000000.0007856e15e1.00
   Active parent node name PXM1E_SJ-02



node index: 2
   PGL state......      OperNotPgl     Init time(sec).......        15
   Priority.......               0     Override delay(sec)..        30
                                       Re-election time(sec)        15
   Pref PGL................0:0:00.000000000000000000000000.000000000000.00
   Pref PGL node name .....
   PGL.....................0:0:00.000000000000000000000000.000000000000.00
   PGL node name ..........
   Active parent node id...0:0:00.000000000000000000000000.000000000000.00
   Active parent node name
```

In the example above, the PGL state changes to show that logical node 1 is now the PGL. Notice that the priority value is 250. An earlier example in this procedure set the priority to 200. When a node is elected PGL, the node adds 50 to its priority value to prevent instability that might be caused by other peer group nodes with a marginally higher priority value.

Step 4 Repeat this procedure for backup peer group leaders and be sure to set their priority value to a lower value so that they operate as backup PGLs.

Enabling and Disabling the Complex Node Feature

The complex node feature applies to PGL parent LGNs in MPG networks. When this feature is disabled, parent LGNs present other peer groups to the child peer group using simple node representation. With simple node representation, each external peer group is presented as a simple node with a single cost for routing through the peer group.

When the complex node feature is enabled, a parent LGN presents other peer groups using complex node representation. Complex node representation provides information about multiple paths through external peer groups, and this gives source route nodes more choices when routing through external peer groups.

Tip For more information on complex nodes, refer to the *Cisco PNNI Network Planning Guide for MGX and SES Products*.

To enable or disable the complex node feature, enter the following command:

```
M8850_LA.8.PXM.a > cnfpnni-node <node-index> -complexNode on|off
```

Replace *node-index* with the index that identifies the logical node you are modifying, and enter either *on* or *off* for the -complexNode parameter. When this parameter is set to on, the node presents external peer groups using complex node representation. When the -complexNode parameter is set to off, the node presents external peer groups using simple node representation.

To view the status of the -complexNode option, enter the **dsppnni-node** command as shown in the following example:

```
M8850_LA.8.PXM.a > dsppnni-node

node index: 1                      node name: M8850_LA
   Level..............        56     Lowest.............       true
   Restricted transit..      off     Complex node........        on
   Branching restricted      off
   Admin status........       up     Operational status..        up
   Non-transit for PGL election..      off
   Node id..............56:160:47.00918100000000036b5e2bb2.00036b5e2bb2.01
   ATM address..........47.00918100000000036b5e2bb2.00036b5e2bb2.01
   Peer group id.........56:47.00.9181.0000.0000.0000.0000.00
```

Enabling and Disabling Routes Through a Node

The restricted transit option allows you to allow or block call routes that pass through the node and terminate on other nodes. The default setting for this option enables calls to pass through.

To enable or disable PNNI routing through a node, enter the **cnfpnni-node** command as follows:

```
mgx8830a.1.PXM.a > cnfpnni-node <node-index> -transitRestricted on|off
```

Replace *node-index* with the index that identifies the logical node you are modifying, and enter either *on* or *off* for the -transitRestricted parameter. When this parameter is set to on, the node only accepts calls that terminate on this node. When the -transitRestricted parameter is set to off, the node accepts calls that pass through the node and terminate on other nodes.

To view the status of the -transitRestricted option, enter the **dsppnni-node** command as shown in the following example:

```
mgx8830a.1.PXM.a >  dsppnni-node

node index: 1                      node name: 8850_LA
   Level...............        56     Lowest..............      true
   Restricted transit..        on     Complex node........       off
   Branching restricted        on
   Admin status........        up     Operational status..        up
   Non-transit for PGL election..       off
   Node id...............56:160:47.00918100000100001a531c2a.00001a531c2a.01
   ATM address...........47.00918100000100001a531c2a.00001a531c2a.01
   Peer group id.........56:47.00.9181.0000.0100.0000.0000.00
```

Enabling and Disabling Point-to-Multipoint Branching

The branching restricted option allows you to enable or disable branching for point-to-multipoint calls. When branching is enabled, the node can receive one source connection and branch that connection to multiple cards and ports. When branching is disabled, a separate source connection is required for every destination card or port. The default setting for this option enables branching for point-to-multipoint calls.

To enable or disable branching in a node, enter the **cnfpnni-node** command as follows:

mgx8830a.1.PXM.a > **cnfpnni-node** <*node-index*> -branchingRestricted on|off

Replace *node-index* with the index that identifies the logical node you are modifying, and enter either *on* or *off* for the -branchingRestricted parameter. When this parameter is set to on, the node does not branch connections. When the -branchingRestricted parameter is set to off, the node performs branching.

To view the status of the -branchingRestricted option, enter the **dsppnni-node** command as shown in the following example:

```
mgx8830a.1.PXM.a >  dsppnni-node

node index: 1                      node name: 8850_LA
   Level...............        56     Lowest..............      true
   Restricted transit..       off     Complex node........       off
   Branching restricted        on
   Admin status........        up     Operational status..        up
   Non-transit for PGL election..       off
   Node id...............56:160:47.00918100000100001a531c2a.00001a531c2a.01
   ATM address...........47.00918100000100001a531c2a.00001a531c2a.01
   Peer group id.........56:47.00.9181.0000.0100.0000.0000.00
```

Adding an ATM Summary Address Prefix

Enter the **addpnni-summary-addr** command to add an ATM summary address prefix for a PNNI logical node on the switch.

mgx8830a.1.PXM.a > **addpnni-summary-addr** <*node-index*> <*address-prefix*> <*prefix-length*> [-type] [-suppress] [-state]

Table 8-1 lists the parameter descriptions for the **addpnni-summary-addr** command.

Table 8-1 Parameters for addpnni-summary-addr Command

Parameter	Description
node-index	The node index assigned to a PNNI logical node on a network. Range = 1 – 65535
address-prefix	The ATM address prefix assigned to the network.
prefix-length	The length of the summary address-prefix in number of bits, equal or less than 152 bits. Currently, the zero-length summary address is not supported.
-type	The type of the summary address.
-suppress	true = summary address is not advertised.
-state	The summary address is advertised | notadvertised | inactive.

Configuring SVCC RCC Variables

Configure SVCC-based RCC variables with the **cnfpnni-svcc-rcc-timer** command as follows:

```
mgx8830a.1.PXM.a > cnfpnni-svcc-rcc-timer <node-index> [-initTime] [-retryTime]
[-callingIntegrityTime] [-calledIntegrityTime]
```

This defines a node's initial PNNI SVCC-based variables, as shown in Table 8-2.

Table 8-2 Parameters for cnfpnni-svcc-rcc-timer Command

Parameter	Description
node-index	Node index.
-initTime	Time (in seconds) that the node delays establishment of an SVCC to a neighbor with a numerically lower ATM address, after determining that such an SVCC should be established.
-retryTime	Time (in seconds) that the node delays before attempting to re-establish an SVCC-based RCC after the RCC is unexpectedly torn down.
-callingIntegrityTime	Time (in seconds) that the node waits for a sent SVCC to become fully established before giving up and tearing it down.
-calledIntegrityTime	Time (in seconds) that the node waits for a received SVCC to become fully established before giving up and tearing it down.

Configuring Routing Policies for Shortest Path Tables

The shortest path tables (SPTs), which are also called background routing tables, are created by default to store the shortest paths or routes to all destinations. These SPTs can be divided into three groups as described in the *Cisco PNNI Network Planning Guide for MGX and SES Products*. Each group stores routes that are optimized for one of the following routing metrics: AW, CTD, or CDV. Within each group, tables are created for each CoS that uses the routing metric.

You can use the **cnfpnni-routing-policy** command to control which SPTs are created, how often they are updated, and other SPT related features. To display the current routing policies for a node, enter the **dsppnni-routing-policy** command as follows:

```
M8830_CH.1.PXM.a > dsppnni-routing-policy

   SPT epsilon.........          0     Load balance........    random
   SPT holddown time...          1     On demand routing... first fit
   bn path holddown time         2     AW Background Table         on
   CTD Background Table         on     CDV Background Table       off
```

To configure the SPT routing policies, enter the **cnfpnni-routing-policy** command as follows:

```
mgx8830a.1.PXM.a > cnfpnni-routing-policy [-sptEpsilon] [-sptHolddown] [-bnPathHolddown]
[-loadBalance] [-onDemand] [-awBgTable] [-ctdBgTable] [-cdvBgTable]
```

Table 8-3 lists the parameter descriptions for the **cnfpnni-routing-policy** command.

Table 8-3 Parameters for cnfpnni-routing-policy Command

Parameter	Description
-sptEpsilon	The SPT epsilon allows you to specify a percentage range in which shortest path routes to a particular destination are considered equal. For example, you can specify that all routes within 6.25% of the lowest cost route are to be considered equal and considered for placement in the appropriate SPT. The range of 0-20 for this parameter comes from the ATM Forum PNNI specification. However, the percentage applied to this range is determined by individual vendors. Cisco Systems currently maps this range to percentages as follows: 0 = The routing metric (which is AW, CTD, or CDV) value for all SPT routes to a particular destination must be identical. 1-2 = The SPT considers routes within 1.06% of the shortest path to be equal. 3-4 = The SPT considers routes within 3.125% of the shortest path to be equal. 5-9 = The SPT considers routes within 6.25% of the shortest path to be equal. 10-15 = The SPT considers routes within 12.5% of the shortest path to be equal. 16-20 = The SPT considers routes within 25.0% of the shortest path to be equal. Default: 0
-sptHolddown	The SPT holddown timer defines the node’s minimum time interval between two consecutive calculations of the SPTs. If a network is stable, it may not be necessary to generate routing tables 10 times per second. In such a case, you can increase the holddown timer value to reclaim CPU time needlessly spent on updating unchanging routing tables. Units: 100 millisecond increments Range: 1-600 (0.1-60 seconds) Default: 1

Table 8-3 Parameters for cnfpnni-routing-policy Command (continued)

Parameter	Description
-bnPathHolddown	The border node holddown timer defines the node's minimum time interval between two consecutive calculations of the border node path tables. If a network is stable, it may not be necessary to generate border node route tables 10 times per second. In such a case, you can increase the value to reclaim CPU time needlessly used to update unchanging routing tables. In such a case, you can increase the holddown timer value to reclaim CPU time needlessly spent on updating unchanging routing tables. Units: 100 millisecond increments Range: 2-600 (0.2-60 seconds) Default: 2
-loadBalance	This parameter defines how routing connections are distributed across the routes stored in the SPTs. For more information, see "Configuring the Load Balance Selection Method," which appears later in this chapter.
-onDemand	This parameter defines how the on-demand routing feature selects routes. For more information, see "Configuring the On-Demand Route Selection Method (First Fit or Best Fit)," which appears later in this chapter. The parameter options are: firstfit = select the first route found bestfit = select the best route Default = **firstfit**
-awBgTable	This parameter enables or disables generation of the AW SPTs for all classes of service. Enter **-awBgTable on** to enable AW SPT generation, or enter **-awBgTable off** to disable it. Default = **on**
-ctdBgTable	This parameter enables or disables generation of the CTD SPTs for the CBR, rt-VBR, and nrt-VBR classes of service. Enter **-ctdBgTable on** to enable CTD SPT generation, or enter **-ctdBgTable off** to disable it. Default = **on**
-cdvBgTable	This parameter enables or disables generation of the CDV SPTs for the CBR and rt-VBR classes of service. Enter **-cdvBgTable on** to enable CDV SPT generation, or enter **-cdvBgTable off** to disable it. Default = **on**

Configuring PNNI Timers

Configure the PNNI timers with the **cnfpnni-timer** command.

`mgx8830a.1.PXM.a >` **`cnfpnni-timer`** <*node-index*> <*options*>

You can define the initial PNNI timer values and significant change thresholds of a PNNI logical node. Table 8-4 lists the parameter descriptions for the **cnfpnni-timer** command.

Table 8-4 Parameters for cnfpnni-timer Command

Parameter	Description
nodeindex	Logical node's node index.
-ptseholddown	This is the holddown time between two consecutive originations of PTSEs on the node. Range: (0.1 through 10) second Default = 1
-helloholddown	Value for the Hello hold down timer that limits the rate at which it sends Hellos.
-hellointerval	Initial value for the Hello timer.
-helloinactivityfactor	Inactivity time factor on a horizontal link between two logical nodes.
-ptserefreshinterval	Time allowed for the PTSE to re-originate.
-ptselifetimefactor	Value for the lifetime multiplier, expressed as a percentage. The product of this value and the **ptserefreshinterval** is sets the remaining lifetime of a self-originated PTSE.
-retransmitinterval	Period between retransmissions of unacknowledged DS, PTSE request, and PTSP.
-ptsedelayedackinterval	Minimum time allowed between transmissions of delayed PTSE acknowledgment packets.
-avcrpm	Proportional multiplier used in the algorithms that determines significant change for AvCR parameters.
-avcrmt	Minimum threshold used in the algorithms that determine significant change for AvCR parameters.
-cdvpm	Proportional multiplier used in the algorithms that determine significant change for CDV parameters.
-ctdpm	Proportional multiplier used in the algorithms that determine significant change for CTD parameters.

Managing PNNI Routes

The following sections describe how to control route and link selection for the links on each PNNI node.

Configuring the On-Demand Route Selection Method (First Fit or Best Fit)

When the PNNI controller searches for routes, it can choose the first route that meets the call requirements, or it can choose the route that provides the best performance. The first fit method chooses the first available route and reduces call processing time. The best fit method chooses the optimum route, but it takes longer to select the route. The default setting is first fit.

Note The route selection process is described in the *Cisco PNNI Network Planning Guide for MGX and SES Products*.

To configure the route selection method, enter the **cnfpnni-routing-policy** command as follows:

```
mgx8830a.1.PXM.a > cnfpnni-routing-policy -onDemand firstfit|bestfit
```

Enter *firstfit* to select the first route discovered, or enter *bestfit* to select the optimum route.

To display the route selection method, enter the **dsppnni-routing-policy** command as follows:

```
mgx8830a.1.PXM.a > dsppnni-routing-policy

   SPT epsilon.........          0     Load balance........    random
   SPT holddown time...          1     On demand routing... first fit
   SPT path holddown time        2     AW Background Table         on
   CTD Background Table         on     CDV Background Table        on
```

The parameter labeled *On demand routing* shows which route selection method is configured.

Configuring the Load Balance Selection Method

When multiple eligible routes are found in an SPT during call setup, the load balancing feature attempts to balance the load among those routes. The load balance options are *random* and *maxbw.* The random option randomly chooses between the eligible routes each time a new call is set up. The maxbw option selects the route with the maximum available bandwidth.

Note The route selection process is described in the *Cisco PNNI Network Planning Guide for MGX and SES Products*.

To configure the load balance option, use the **cnfpnni-routing-policy** command as follows:

```
mgx8830a.1.PXM.a > cnfpnni-routing-policy -loadBalance random|maxbw
```

Enter *random* to randomly choose among the eligible route, or enter *maxbw* to select the route with the greatest available bandwidth.

To display the route selection method, enter the **dsppnni-routing-policy** command as follows:

```
mgx8830a.1.PXM.a > dsppnni-routing-policy

   SPT epsilon.........          0     Load balance........    random
   SPT holddown time...          1     On demand routing... first fit
   SPT path holddown time        2     AW Background Table         on
   CTD Background Table         on     CDV Background Table        on
```

The parameter labeled *Load balance* shows which load balance method is configured.

Managing Preferred Routes

You can manually create a route that is preferred for specific SPVC and SPVP connections. Once a preferred route is created, the associated SPVC or SPVP connections will attempt to route through the preferred route before attempting other routes.

Note A preferred route can be assigned to multiple SPVCs or SPVPs.

Preferred routes can be configured to be *directed* or *non-directed*. A directed route only attempts a connection on the preferred route. If the connection cannot route over the preferred route, that connection will go into a failed state. A *non-directed* route first attempts to route over the preferred route. If the preferred route is not available, the connection will be attempted over other routes.

Keep the following in mind when planning preferred routes:

- All nodes in the preferred route must exist in the network node table.
- A preferred route can be confined to the same peer group as the source node, or it can go outside the local peer group.
- A preferred route can include non-Cisco nodes.
- A node can appear only once in a preferred route.
- Any preferred routes you defined using Release 3 software will be lost during an upgrade to Release 4. Once you have upgraded to Release 4, you must be manually re-enter your preferred routes. Prior to an upgrade, use the **dspprefs** command view all the configured preferred routes. Write down any preferred routes you want to re-enter once you have upgraded to Release 4.
- The preferred route feature is not compatible with point-to-multipoint SPVC configuration.
- Connections mastered on an RPM or VISM cannot be associated with a preferred route.

Note In Release 4, Cisco MGX switches with PXM45/A, PXM45/B, or PXM1E controllers support up to 5000 preferred routes per switch. When used with PXM45/C controllers, Cisco MGX 8850 (PXM45) and Cisco MGX 8950 switches, and the MGX 8880 Media Gateway, support up to 10000 preferred routes.

A preferred route consists of a sequential list of up to 20 nodes, including the local node that hosts the starting point of the preferred route. The destination node can be up to 19 network elements (NEs), or 19 NNI links, away from the local node.

Note VISM-PR cards do not support preferred routes in Release 5. Any VISM-PR preferred routes that were configured in a previous release will be lost when the switch is upgraded to Release 4.

Maintaining the Network Node Table

To support preferred routes, the network administrator manually creates a node table that contains information about all the nodes in the network. All the nodes that will be in a preferred route must appear in the network node table, and each node in a preferred route must have its own entry in the network table.

Cisco recommends that you keep the same network node table on every node in your network for the purpose of convenience when configuring preferred routes. Once you create the node table on one node, you can to FTP that table to all the other nodes in the network. If you change any information in one of the node tables, you need to update all of the node tables in the network to ensure synchronicity.

Before you can create a preferred route, all the nodes that will be in the preferred route must be in the network node table. Enter the **dspnwnodes** command to ensure that all the nodes in your planned preferred route are in the network node table, as shown in the following example:

```
U1.8.PXM.a > dspnwnodes

Node Identifier PXM Pref rte Node name
     ------------------------------------------------- ----- -------- ---------
     56:160:47.009181000000003071f80406.003071f80406.01 pxm1 No Fargo
     56:160:47.009181000000003071f80422.003071f80422.01 pxm45 No Denver
     56:160:47.339181000000003071f80433.003071f80433.01 pxm1E Yes Chicago
```

If one or more nodes in your preferred route does not appear in the network node table, use the following procedure to add the missing nodes to the table.

Step 1 Establish a configuration session using a user name with GROUP1 privileges or higher.

Step 2 Enter the **addnwnode** command as follows to add the a node to the network node table:

U1.8.PXM.a > **addnwnode** <*nodeId*> <*pxmType*> [**-name** <*nodeName*>]

Table 8-5 describes the parameters you can configure through the **addnwnode** command.

Table 8-5 addnwnode Command Parameters

nodeId	This 22-octet uniquely identifies a PNNI node.
pxmType	Type of controller card in the switch. The controller type determines how the software converts between the physical and logical port identifiers. Type one of the following case-sensitive strings: • PXM45 • PXM1 • PXM1E • Others (for non-Cisco nodes) **Note** If you enter *Others* as the *pxmType*, you can not use the portId to build a preferred route. (See the *neSyntax* parameter in Table 8-6.)
-name	A string of up to 32 case-sensitive IA5 characters (except when empty) describing a PNNI node. If you plan to build a preferred route by using node names, you *must* include the **-name** option for entries in the network node table. Default: an empty string

In the following example, the user adds a PXM1E node named LA to the network.

```
MGX8850.7.PXM1E.a > addnwnode 56:100:47.009181000000003071f80406.003071f80406.01 PXM1E
-name LA
```

Step 3 Enter the **dspnwnode -id** <*nodeId*> or the **dspnwnode -name** <*nodeName*> command to ensure that the node you added in Step 2 appears in the network node table. If you use the **dspnwnode -id** <*nodeId*> command, replace <*nodeId*> with the 22-octet node identifier. If you use the **dspnwnode -name** <*nodeName*> command, replace <*nodeName*> with the name you assigned to the node in Step 2.

Enter the **cnfndidrtes** command to replace a node ID with a different ID for all configured preferred routes. For example, if you remove a node that is a network element (NE) in one or more preferred routes, you can use the **cnfndidrtes** to enter a different node's name. Providing that the new node's name appears in the network node table, the new node replaces the old node in the preferred route. Enter the **cnfndidrtes** command as shown in the following example:

cnfndidrtes <*oldNodeId*> <*newNodeId*>

Replace <*oldNodeId*> with the 22-octet identifier for the node you want to replace. Replace <*newNodeId*> with the 22-octet identifier of the new node that replaces the old node.

Creating a Preferred Route

Use the following procedure to create a preferred route.

Step 1 Enter the **dspnwnodes** command to see the nodes in this database. These are the nodes you can use to set up your preferred route.

```
U1.8.PXM.a > dspnwnodes
Total Number of Network Nodes : 14
     Node Identifier PXM Node name
     --------------- --- ---------
     56:160:47.0091810000000004c113ba39.0004c113ba39.01 PXM45 p2spvc7
     56:160:47.00918100000000001a531c41.00001a531c41.01 PXM45 p2spvc14
     56:160:47.009181000000000142266086.000142266086.01 PXM45 p2spvc15
     56:160:47.00918100000000001a531c01.00001a531c01.01 PXM45 p2spvc20
     56:160:47.00918100000000001a531c43.00001a531c43.01 PXM45 pswpop2-1
     56:160:47.009181000000000164444ae0.000164444ae0.01 PXM45 pswpop2-2
     56:160:47.00918100000000107be92fde.00107be92fde.01 PXM45 pswpop10
     56:160:47.00918100000000c043002ddf.00c043002ddf.01 PXM1 pswpop9
     56:160:47.009181000000003071f81323.003071f81323.01 PXM1 pnnises3
     56:160:47.009181000000003071f8139d.003071f8139d.01 PXM1 pnnises4
     56:160:47.00918100000000d058ac28e9.00d058ac28e9.01 PXM1 svcswp13
     56:160:47.00918100000000c043002dcc.00c043002dcc.01 PXM1 svcswp15
     56:160:47.0391810000000050e2003e16.0050e03e1600.00 Others svcslt5
     56:160:47.0391810000000050e2001600.50e000000000.00 Others svcslt6
```

Step 2 Enter the **addpref** command to set up your preferred route as follows:

```
8850_LA.7.PXM.a > addpref <routeid> <neSyntax> [-dstNEpos <NE>] [-ne1 {<node>/<port>}]
[-ne2 {<node>/<port>}] ... [-ne20 {<node>/<port>}]
```

Table 8-6 describes the parameters you can configure for the **addpref** command.

Table 8-6 addpref Command Parameters

routeid	The preferred route identifier has a range of 1–65535. If a particular ID is in use, the node rejects the command. Check the **dspprefs** output for available route IDs as needed.
neSyntax	Four ways of identifying the NEs exist. Use the selected form for all NEs in the route Type one of the following keywords: • **nodeidPnportid** means the node is specified by the 22-octet node ID and the port by the PNNI logical integer *pnPortId*. • **nodenamePortid** means the node is specified by the node name and the port by the physical *port ID*. You can use node names only if the node names were added to the network node table (in addition to the mandatory node IDs). You can not use the physical port ID syntax if the pxmType is provisioned as *Others*. (See Table 8-5.) • **nodeidPortid** means the node is specified by the 22-octet node ID and the port by the physical *port ID*. You can not use the physical port ID syntax if the pxmType is provisioned as *Others*. (See Table 8-5.) • **nodenamePnportid** means the node is specified by the node name and the PNNI logical port by the integer *pnPortId*. You can use node names only if the node names were added to the network node table (in addition to the mandatory node IDs). The nodeID is the 22-octet PNNI node ID. The Portid is the PNNI physical port ID. On a PXM1E, the format is *slot***.***port*. On a PXM45, the format is *slot***:***subslot***.***port***:***subport*. The *PnportID* is the PNNI logical port identifier. This form of port identifier is an integer in the range 0–4294967295. Default: none
-dstNEpos	This integer identifies the position of the destination node in the NE sequence. For instance, an *NE* of 4 indicates that the fourth NE represents the destination node. Range: 1–20 Default: none
-ne1 through -ne20	Including the local node, you can specify up to 20 NEs in the preferred route. Each NE is defined by a pairing of a node and a port. The format of these paired elements must conform to the entry for *neSyntax***.** Separate the values in the pairing by a slash and no spaces, but put a space between the keyword and NE, as follows: **-ne***(n)* ***node*****/*****port*** The NE you specify as the destination node must be the highest numbered keyword, otherwise the switch rejects the command.The port identifier at the destination node must be set to *0*. Note that the value *0* actually determines the last NE in the route. This *0* appears in the outputs of the display commands for preferred routes. For example, if a route has 9 NEs, the format would be: **-ne9** ***node*****/0**

Step 3 Enter the **dsppref** <*routeId*> command to verify the preferred route was configured correctly. Replace <*routeId*> with the preferred routes identifier.

Step 4 Associate the appropriate SPVC or SPVP to the preferred route you created in Step 2.

a. If you are associating a new SPVC or SPVP with the preferred route, enter the **addcon** command as follows:

addcon <*ifNum*> <*vpi*> <*vci*> <*serviceType*> <*mastership*> -**prefrte** <*preferredRouteId*> [-**directrte** <*directRoute*>]

Note For PXM1E cards, the **addcon** command is entered at the PXM card prompt. For all other cards, the **addcon** command is entered at the service module prompt.

Table 8-7 describes the parameters you can configure for the **addcon** command.

b. If you are associating a previously created SPVC/SPVP with the preferred route, enter the **cnfcon** command, as follows:

cnfcon <*ifNum*> <*vpi*> <vci> <*serviceType*> <**mastership**> -**rtngprio** <*routingPriority*> -**prefrte** <*preferredRouteId*> [-**directrte** <*directRoute*>]

Note For PXM1E cards, the **cnfcon** command is entered at the PXM card prompt. For all other cards, the **addcon** command is entered at the service module prompt.

Table 8-7 describes the parameters you can configure for the **cnfcon** command.

Note There are other optional parameters that you can set using the **addcon** and **cnfcon** commands, but they do not appear in Table 8-7 because you do not need to set them when you are associating an SPVC or SPVP with a preferred route. For information on all the command parameters for PXM1E cards, see Chapter 3, "Provisioning PXM1E Communication Links." For information on all the **addcon** and **cnfcon** command parameters a service module, refer to the appropriate service module guide, all of which are listed in Table 1-1.

Table 8-7 addcon and cnfcon Preferred Route Command Parameters

Parameter	Description
ifNum	Logical interface (or port) number. This ifNum corresponds to the ifNum added through the **addport** command. The range is 1-31.
vpi	Virtual path identifier value in the range 0-255 (UNI) or 0-4095 (NNI or VNNI). For VNNI, specify one VPI per port.
vci	Virtual connection identifier (VCI): For a VCC on a UNI, the range is 1-4095. On an NNI or VNNI, the VCI range is 1-65535. For MPLS, the recommended minimum VCI is 35. For a VPC, the vci is 0.
mastership	Value to specify the endpoint as master or slave: • 1 or `m' specifies the master end. • 2 or `s' specifies the slave end.

Table 8-7 addcon and cnfcon Preferred Route Command Parameters (continued)

-prefrte	Associates a preferred route (preferredRouteId) to the connection. Use this optional parameter at the master endpoint only. Range: 0-65535 Default: 0
-directrte	Specifies that the connection can take only the preferred route associated through the -prefrte parameter. Use this optional parameter at the master endpoint only. To remove this requirement from the connection, use the cnfcon command and specify a 0 for the parameter. The possible values are as follows: 1: yes (make the preferred route required) 0: no (do not require the connection to take the preferred route) Default: no (0)

Step 5 Enter the **dspcon** <*portid*> <*vpi*> <*vci*> command to ensure that the SPVC/SPVP has been configured properly and is associated with the preferred route you set up in Step 1. Replace <*portid*> with the port identifier in the format *slot*:*bay.line*:*ifnum*. Replace <*vpi*> with the virtual path identifier for the connection. Replace <*vpi*> with the virtual circuit identifier for the connection.

Modifying a Preferred Route

Use the **cnfpref** command to modify a preferred route. The **cnfpref** command lets you re-specify existing NEs in a route, or add one or more NEs to an existing route. You can also change an NE to indicate that it is the destination node. A new destination node must have the highest NE number in the route. (See the detailed usage guidelines for the **addpref** command for details.)

Enter the **cnfpref** command as follows:

```
8850_LA.7.PXM.a > cnfpref <rteId> <neSyntax> [-dstNePos <Ne>] [-ne1 {<node>/<port>}] [-ne2
{<node>/<port>}] ... [-ne20 {<node>/<port>}]
```

Table 8-8 describes the **cnfpref** command parameters.

Table 8-8 Parameters for cnfpref Command

Parameter	Description
routeid	The preferred route identifier has a range of 1–65535. If a particular ID is in use, the node rejects the command. Check the **dspprefs** output for available route IDs as needed.
neSyntax	Four ways of identifying the NEs exist. Use the selected form for all NEs in the route Type one of the following keywords: • **nodeidPnportid** means the node is specified by the 22-octet node ID and the port by the PNNI logical integer *pnPortId*. • **nodenamePortid** means the node is specified by the node name and the port by the physical *port ID*. You can use node names only if the node names were added to the network node table (in addition to the mandatory node IDs). You can not use the physical port ID syntax if the pxmType is provisioned as *Others*. (See Table 8-5.) • **nodeidPortid** means the node is specified by the 22-octet node ID and the port by the physical *port ID*. You can not use the physical port ID syntax if the pxmType is provisioned as *Others*. (See Table 8-5.) • **nodenamePnportid** means the node is specified by the node name and the PNNI logical port by the integer *pnPortId*. You can use node names only if the node names were added to the network node table (in addition to the mandatory node IDs). The nodeid is the 22-octet PNNI node ID. The Portid is the PNNI physical port ID. On a PXM1E, the format is *slot***.***port*. On a PXM45, the format is *slot***:***subslot***.***port***:***subport*. The *Pnportid* is the PNNI logical port identifier. This form of port identifier is an integer in the range 0–4294967295. Default: none

Table 8-8 Parameters for cnfpref Command (continued)

-dstNEpos	This integer identifies the position of the destination node in the NE sequence. For instance, an *NE* of 4 indicates that the fourth NE represents the destination node. Range: 1–20 Default: none
-ne1 through -ne20	Including the local node, you can specify up to 20 NEs in the preferred route. Each NE is defined by a pairing of a node and a port. The format of these paired elements must conform to the entry for *neSyntax***.** Separate the values in the pairing by a slash and no spaces, but put a space between the keyword and NE, as follows: **-ne***(n) **node**/**port*** The NE you specify as the destination node must be the highest numbered keyword, otherwise the switch rejects the command.The port identifier at the destination node must be set to *0*. Note that the value *0* actually determines the last NE in the route. This *0* appears in the outputs of the display commands for preferred routes.For example, if a route has 9 NEs, the format would be: **-ne9** ***node*/0**

To see a list of all preferred routes and obtain the required route index for the **cnfpref** command, enter the **dspprefs** command. To see details about individual preferred route, use the **dsppref** <*routeId*> command, and replace <*routeId*> with the preferred route identifier.

Note Preferred routes that were configured on switches running Release 3 will be lost when you upgrade the switch to Release 4. Once you have upgraded the switch to Release 4, you need to re-configure your preferred routes.

Deleting a Preferred Route

Enter the **delpref** <*routeId*> command to delete a preferred route description.Before you delete a preferred route, you must ensure that no SPVCs/SPVPs have that preferred route currently associated with them. Enter the **dspcons -rteid** <*routeId*> command to verify that there are no SPVCs/SPVPs associated with the preferred route you want to delete. Replace <*routeId*> with the route identifier for the preferred route you want to display.

To disassociated any SPVCs/SPVPs from the preferred route, enter the **cnfcon** command as follows:

```
8850_LA.7.PXM.a > cnfcon <ifNum> <vpi> <vci> <serviceType> <mastership> -rtngprio
<routingPriority> -prefrte 0
```

Table 8-7 describes the parameters you need to configure with the **addcon** command. Note that you must set the **-prefrte** parameter to *0* to disassociate a connection with a preferred route.

Deleting a Node from the Network Node Table

Before you can delete a node from the network node table, enter the **dspnwnode** <nodeId> command to ensure that the node is not part of a preferred route.

> **Note** You can not delete a node from the network node table if it is currently being used by a preferred route.

If the node you want to delete is not being used by a preferred route, enter the **delnwnode** <*nodeId*> command to delete the node from the network node table. Replace <*nodeId*> with the 22-octet node identifier that you set with the **addnwnode** command, as described in the "Maintaining the Network Node Table" section earlier in this chapter.

Configuring Link Selection for Parallel Links

When parallel links exist between two nodes on a route, the node closest to the originating node selects a link based on one of the following factors:

- lowest administrative weight (minaw)
- maximum available cell rate (maxavcr)
- maximum cell rate configured for the link (maxcr)
- random link selection (loadbalance)

> **Note** The route selection process is described in the *Cisco PNNI Network Planning Guide for MGX and SES Products*.

To configure the link selection method, enter the **cnfpnni-link-selection** command as follows:

```
mgx8830a.1.PXM.a >  cnfpnni-link-selection pnportid minaw|maxavcr|maxcr|loadbalance
```

Replace *pnportid* with the port ID in the format slot[:subslot].port[:subport]. (This is the same format that appears when you display ports with the **dsppnport** command.) Enter one link selection method after the port ID.

To display the link selection method, enter the **dsppnni-link-selection** command as follows:

```
mgx8830a.1.PXM.a > dsppnni-link-selection 1:2.1:1

physical port id:         1:2.1:1     link selection: minaw
 logical port id:        16848897
```

Configuring the Maximum Bandwidth for a Link

The maximum bandwidth for a link is defined when a PNNI partition is configured for a port. For more information, see Chapter 3, "Provisioning PXM1E Communication Links."

Configuring the Administrative Weight

The link administrative weight (AW) is used to calculate the total cost of a route and can be used by the PNNI controller when it has to choose between multiple parallel links. You can assign different AW values for each ATM class of service.

Note The role of AW in route and link selection is described in more detail in the *Cisco PNNI Network Planning Guide for MGX and SES Products*.

To configure the AW for a link, enter the **cnfpnni-intf** command as follows:

```
mgx8830a.1.PXM.a > cnfpnni-intf <pnportid> [-awcbr] [-awrtvbr] [-awnrtvbr] [-awabr]
[-awubr] [-awal]
```

Replace *pnportid* with the port ID in the format slot[:subslot].port[:subport]. (This is the same format that appears when you display ports with the **dsppnport** command.) For each class of service for which you want to change the AW value, enter the appropriate option followed by the new value. For example, the following command sets the AW for CBR calls over the link:

```
mgx8830a.1.PXM.a > cnfpnni-intf 1:2.1:1 -awcbr 2000
```

To display the AWs assigned to a PNNI port, enter the **dsppnni-intf** command as follows:

```
mgx8830a.1.PXM.a >  dsppnni-intf 1:2.1:1

Physical port id: 1:2.1:1          Logical port id:   16848897
   Aggr token..........        0     AW-NRTVBR...........      5040
   AW-CBR.............      2000     AW-ABR..............      5040
   AW-RTVBR...........      5040     AW-UBR..............      5040
```

Configuring the Aggregation Token

The link aggregation token is used when multiple links connect two nodes. An aggregation token serves as a label that determines if two or more links should be advertised as separate links or as one. For example, if two links connect two nodes and the aggregation node on each link is set to 5, only one link is advertised. The numeric value of the token has no significance. What is important is whether links have the same token value as other links.

If there were two nodes with three OC-3 links and two T3 links between them, you could aggregate the three OC-3 links into one group with a token of 33 and the two T3 links into another group with a token of 3. This approach would result in two link advertisements: one for a single OC-3 link and one for a single T3 link.

Note For more information on the aggregation token, refer to the *Cisco PNNI Network Planning Guide for MGX and SES Products*.

To configure the aggregation token for a link, enter the **cnfpnni-intf** command as follows:

```
mgx8830a.1.PXM.a > cnfpnni-intf <pnportid> [-aggregationToken token]
```

Replace *pnportid* with the port ID in the format slot[:subslot].port[:subport]. (This is the same format that appears when you display ports with the **dsppnport** command.) Replace token with the value you want to assign to the link. The range is 0 to 4294967295, and the default value is 0. The token value of 0 disables link aggregation for the link. Therefore, to enable two or more links to be advertised as one, you must configure the aggregation token on each link to a matching, nonzero value.

The following command assigns token value 5 to a link:

```
M8850_LA.8.PXM.a > cnfpnni-intf 12:1.1:1 -aggregationToken 5
```

To display the AWs assigned to a PNNI port, enter the **dsppnni-intf** command as follows:

```
M8850_LA.8.PXM.a > dsppnni-intf 12:1.1:1

Physical port id: 12:1.1:1         Logical port id:   17569793
   Aggr token..........         5     AW-NRTVBR...........      5040
   AW-CBR..............      5040     AW-ABR..............      5040
   AW-RTVBR............      5040     AW-UBR..............      5040
```

Configuring the Bandwidth Overbooking Factor

The bandwidth overbooking factor represents the percentage of the actual available bandwidth that is advertised for links as the Available Cell Rate (AvCR). The default overbooking factor is 100, and this specifies that 100% of the actual available bandwidth should be advertised as the AvCR. When the overbooking factor is set below 100, a link is oversubscribed because the bandwidth booked for each connection exceeds the configured bandwidth for the connection. When the overbooking factor is set above 100, the link is under subscribed because the bandwidth booked for a connection exceeds the connection's configured bandwidth.

Note For more information on the bandwidth overbooking factor, refer to the *Cisco PNNI Network Planning Guide for MGX and SES Products*.

To configure the bandwidth overbooking factor for a PNNI port, enter the **cnfpnportcac** command as follows:

```
mgx8830a.1.PXM.a > cnfpnportcac <pnportid> <service_catogory>
[-bookfactor <utilization-factor>]
```

Replace *pnportid* with the port ID in the format slot[:subslot].port[:subport]. (This is the same format that appears when you display ports with the **dsppnport** command.) Replace *service_catogory* with the ATM class of service for which you are defining the overbooking factor, and replace *utilization-factor* with the new overbooking factor. For example:

```
mgx8830a.1.PXM.a >  cnfpnportcac 1:2.1:1 cbr -bookfactor 120
WARNING: New CAC parameters apply to existing connections also
```

To display the bandwidth overbooking factor for all classes of service, enter the **dsppnportcac** command as shown in the following example:

```
mgx8830a.1.PXM.a >  dsppnportcac 1:2.1:1

                    cbr:        rt-vbr:        nrt-vbr:          ubr:          abr:          sig:
bookFactor:         120%          100%            100%          100%          100%          100%
maxBw:        100.0000%     100.0000%       100.0000%     100.0000%     100.0000%     100.0000%
minBw:          0.0000%       0.0000%         0.0000%       0.0000%       0.0000%       0.3473%
maxVc:             100%          100%            100%          100%          100%          100%
minVc:               0%            0%              0%            0%            0%            1%
maxVcBw:             0             0               0             0             0             0
```

Configuring the Deroute Delay

The deroute delay feature establishes a wait time between the time when the switch detects an interface failure and the time when connections are released (derouted). This feature provides time for the condition that caused the interface failure to recover. If the interface recovers, an unnecessary deroute is avoided. If the interface does not recover by the end of the deroute delay, all connections on that interface are derouted.

A separate deroute delay applies to each interface. By default, the deroute delay is disabled. When configuring a deroute delay, consider the following guidelines:

- When deroute delay is enabled and a port goes into provisioning mode (due to card removal or a partition deletion), the end being provisioned will release the connections. The other end will detect LOS and hold the connections for the deroute delay period.
- For the deroute delay feature to operate correctly, both ends of a trunk must use the same deroute delay configuration. If a third party switch does not support deroute delay, this feature should be disabled on Cisco MGX switch interfaces that connect to the third party switch.
- For the deroute delay feature to work, the *ILMI Secure Link Procedures* feature should be disabled on the port using the **cnfilmiproto** command. Otherwise, the release initiation will start as soon as the ILMI protocol resets. Note that there is no impact on PNNI NNI interfaces when the *ILMI Secure Link Procedures* feature is disabled.
- If a continuity check (CC) is enabled on a connection when the host interface fails, an AIS signal will be sent to the CPE, regardless of the deroute delay or AIS delay configuration. When using deroute delay or AIS delay on a host interface, disable CC (**cnfcon** command) on all connections that use that interface.
- If you configure deroute delay on an AXSM-E or an AXSM-XG NNI interface, you must disable AIS generation on the interface using the **cnfatmln** command.

Note There is a special case where disabling AIS generation can create problems. If you configure an IMA group, we recommend that you configure all ports on that IMA group as either UNI or NNI ports. If you configure an IMA group with a mix of UNI and NNI ports, and then you disable AIS generation, AIS generation will be disabled for both UNI and NNI ports. We recommend that you do not disable AIS on UNI ports.

To change the deroute delay, enter the **cnfpnportloscallrel** command as follows:

```
PXM1E_SJ.7.PXM.a > cnfpnportloscallrel <portid> <yes|no> [-delay <time>]
```

Enter the *portid* in the format: [shelf.]slot[:subslot].port[:subport]. To display the port numbers, enter the **dsppnports** command.

To enable the deroute delay and configure a delay period, enter **yes** after the *portid* and enter the **-delay** option with a time in the range of 1 to 59 seconds. The parameter following the *portid* is the loss of signal (LOS) call release parameter. When this parameter is set to **yes**, a LOS releases the call after any configured deroute delay. When this parameter is set to **no**, the call is released upon a Service Specific Connection Oriented Protocol (SSCOP) reset, which is controlled by the SSCOP timers.

To disable the deroute delay, enter the **-dela**y option with the time set to **0** seconds.

The following example sets the deroute delay to 20 seconds and uses the **dsppnportloscallrel** command to verify the configuration change:

```
PXM1E_SJ.7.PXM.a > cnfpnportloscallrel 7:2.10:10  yes -delay 30

PXM1E_SJ.7.PXM.a > dsppnportloscallrel 7:2.10:10
Deroute Delay: 30 seconds
Call release on Los :enabled
```

Improving and Managing Rerouting Performance

The following sections provide some guidelines for improving and managing rerouting performance for the following network configurations:

- Pure PXM45/C Networks
- Hybrid Networks with PXM45/C and PXM45/B
- Pure PXM45/B Networks Running Version 3.0.10 or Later
- Hybrid Networks with PXM45/C and PXM45/A

Pure PXM45/C Networks

To improve rerouting performance in a pure PXM45/C based network, Cisco recommends entering the following commands on the active PXM45/C in each switch:

- **cnfnodalcongth** -setuphi 1200
- **cnfnodalcongth** -connpendhi 2400 -connpendlo 2000
- **cnfnodalcongth** -incompjour 30

To improve rerouting over specific NNI links, enter the following PXM45 commands at both ends of each link:

- **cnfintfcongth** <*physical port*> -setuphi 500
- **cnfpnctlvc** <*physical port*> sscop -scr 3000

Note These parameters are recommended only for the PXM45/C cards and not for the PXM45, PXM45/B or PXM1E cards.

Hybrid Networks with PXM45/C and PXM45/B

If the recommended settings for a pure PXM45/C network are used in a network that contains PXM45/B cards, the PXM45/B nodes can experience CLI lockout as a result of the volume of connections set up by the PXM45/C cards. CLI lockout is a condition where switch response to CLI commands is very slow because the switch is overloaded with other tasks.

For hybrid networks with PXM45/C and PXM45/B nodes, consider upgrading the PXM45/B nodes or limit the performance of the PXM45/C nodes to that of the PXM45/B nodes.

Pure PXM45/B Networks Running Version 3.0.10 or Later

To improve rerouting performance in a pure PXM45/B based network (Version 3.0.10 or later), Cisco recommends entering the following commands on the active PXM45/B in each switch:

For better call performance on PXM45/B cards, the following commands need to be issued after the upgrading to Release 3.0.10:

- **cnfnodalcongth** -connpendlo 750 -connpendhi 1000
- **cnfnodalcongth** -setuphi 1000

To improve rerouting over specific NNI links, enter the following PXM45 commands at both ends of each link:

- **cnfintfcongth** <*physical port*> -setuphi 500
- **cnfpnctlvc** <*physical port*> sscop -scr 3000

Note These parameters are recommended only for the PXM45/B cards and not for the PXM45, PXM45/C, or PXM1E cards.

Hybrid Networks with PXM45/C and PXM45/A

If the recommended settings for a pure PXM45/C network are used in a network that contains PXM45/A cards, the PXM45/A nodes can experience CLI lockout as a result of the volume of connections set up by the PXM45/C cards. CLI lockout is a condition where switch response to CLI commands is very slow because the switch is overloaded with other tasks. A normal deroute followed by a reroute will result in a CLI lockout on the PXM45A node.

The CLI lockout is extensive when a PXM45/A node is a via node between PXM45C based end nodes and there are permanently failed connections originating on the PXM45C end nodes. To prevent an extensive lockout, configure the PXM45C nodes that are adjacent to the PXM45A node using the following PXM command:

cnfnodalcongth -connpendhi 950 -connpendlo 750

Note This is same as the recommended threshold for PXM45/B nodes. This will configure the PXM45/C nodes to limit the number of connection setups forwarded to the PXM45A node.

Managing Priority Routing

When an SPVC is created, it can be prioritized so that the user has more control over the sequence in which connections are routed, rerouted, and derouted in the network. Should a trunk fail, the configured priorities also apply to the rerouting of connections on the failed trunk.

Routing priorities are set in a range from 0 through 15, with 0 being the highest priority and 15 being the lowest priority. 0 priority is reserved for networking control connections, while priorities 1 through 15 can be assigned to user connections.

Within the priority categories of 0 through15, connections are further divided into groups based on their bandwidth. Connections requiring more bandwidth are routed before those requiring less bandwidth. The number of bandwidth groups is fixed at 50, but you can specify the following ranges:

- range with the lowest bandwidth requirement
- range of cells per second in each range between the highest and lowest ranges.

Because the bandwidth groups are node-level, they apply to all priorities. The same ranges exist for priority 0, priority 1, priority 2, and so on down to the lowest priority. Connections requiring the least bandwidth are grouped at the low end of the range, and connections requiring the most bandwidth are grouped at the top end of the range. The remaining connections are progressively grouped somewhere between the upper and lower bounds.

Bandwidth for a priority is divided into three parts:

- lowest range—You determine the lowest range by specifying the highest rate within the range. For example, if you type 3000, the lowest range is 0–3000 cps.
- highest range—Highest range is what is left over after you specify the *lowest* range, the *number* of bandwidth groups, and the number of *cells per second* in each bandwidth increment.
- All incremental ranges between the lowest and the highest.

Note The derouting of SVCs uses the same priority routing criteria and the derouting of SPVCs.

Before you can prioritize a specific SPVC, you must set up the priority routing feature on the node itself, as described in the section that follows.

Establishing Priority Routing on a Node

To display the current routing priority configuration, enter the **dsppri-routing** command:

```
PXM1E_SJ.7.PXM.a > dsppri-routing

Priority Routing Configuration
--------------------------------
Number of bandwidth groups: 50
Size of first bandwidth group (in cps): 5000
Increment between bandwidth groups (in cps): 1000
Routing event buffer size (in 0.1-seconds): 0
Node startup routing delay (in 0.1-seconds): 0
```

To change the priority routing configuration, enter the **cnfpri-routing** command using the following format:

```
mgx8830a.1.PXM.a > cnfpri-routing [-bwgrps <grps>] [-bwstart <start>] [-bwincr
<incr>][-pribuf <time>] [-nodebuf <delay>]
```

Table 8-9 describes the options available in the **cnfpri-routing** command.

Table 8-9 cnfpri-routing Command Parameters

Parameter	Description
-bwgrps	Bandwidth groups.
-bwstart	The value for **bwstart** is the highest cell rate in the lowest-speed bandwidth group. The number of bandwidth groups is fixed at 50. Range: 1–500000 Default: 5000
-bwincr	The increment for the cell rate between the upper and lower bounds of each intermediate bandwidth group. For example, an increment of 2000 means that a range starting at 10000 cps ends at 12000 cps. This increment does not apply to the following groups: • The group with the lowest bandwidth requirements: for this group, the range is determined by the value for **bwstart**. • The group with the highest bandwidth requirements: for this group, the range is what remains after computations based on the following values: – **bwstart** – **bwincr** Range: 1–500000 Default: 1000
-pribuf	The priority buffer is a time counter. It counts down to the moment when PNNI prioritizes all buffered connections for routing. A connection is buffered due to an event that causes PNNI to re-route the connection. The routing events are as follows: • Interface with a master endpoint comes up. • Routed SPVC or SPVP is released (or failed). • SPVC or SPVP is created. • Route optimization begins. Range: 0–600, in units of 0.1 seconds (0–60 seconds) Default: 0
-nodebuf	The node buffer is a time counter. It counts down the time to wait before PNNI starts routing connections. Down-counting begins when the first PNNI logical port comes up. The buffer operates once, after node start-up or node reset. Range: 0–3000, measured in units of 0.1 seconds (0–300 seconds) Default: 0

Configuring Priority Routing for an SPVC

Once priority routing has been set up on a node, you can prioritize the node's SPVCs. A connection's priority is designated during the SPVC master end setup with the **addcon** command. (See the "Configuring the Master Side of SPVCs and SPVPs" section in Chapter 3, "Provisioning PXM1E Communication Links.")

The following command example defines a port as the master side of an SPVC with a routing priority of 3.

```
mgx8830a.1.PXM.a > addcon 3 101 101 1 1 -slave -rtngprio 3
47009181000000000001A531C2A00000101180300.101.101
master endpoint added successfully
master endpoint id : 47009181000000000107B65F33C0000010A180300.101.101
```

Note If you are setting up priority routing on a node that already has established SPVCs, their routing priority is set to 8 by default. You can change the routing priority on an established connection with the **cnfcon** command. (See the next section "Modifying SPVC Priority Routing Configuration."

Modifying SPVC Priority Routing Configuration

Enter the **cnfcon** command and use the *-rtngprio* option to change an SPVC's routing priority, as shown in the following example:

```
mgx8830a.1.PXM.a > cnfcon 3 101 101 -rtngprio 6
```

Configuring Priority Routing for an SVCs

You can set the routing priority for all SVCs that use a specified interface. This feature also sets the routing priority for any SPVCs for which the routing priority information element has been deleted.

Note The SPVC routing priority information element may be deleted by third party nodes that do not support this feature.

The following command example shows how to change the SVC routing priority for an interface and verify the change.

```
M8830_CH.1.PXM.a > dnpnport 6.1

M8830_CH.1.PXM.a > cnfpnportsig 6.1 -svcroutingpri 10

M8830_CH.1.PXM.a > uppnport 6.1
```

```
M8830_CH.1.PXM.a > dsppnport 6.1

Port:                6.1              Logical ID:       16855809
IF status:           up               Admin Status:     up
VSVD Internal Loop: unspecified
VSVD External Loop: unspecified
UCSM:                enable           SVC Routing Pri:  10
Auto-config:         enable           Addrs-reg:        enable
IF-side:             network          IF-type:          uni
UniType:             private          Version:          none
PassAlongCapab:      n/a
Input filter:        0                Output filter:    0
minSvccVpi:          6                maxSvccVpi:       6
minSvccVci:          35               maxSvccVci:       35
minSvpcVpi:          6                maxSvpcVpi:       6

P2P Details:
       (P=Configured Persistent Pep, NP=Non-Persistent Pep, Act=Active)
       #Spvc-P:  #Spvc-NP:  #SpvcAct:  #Spvp-P:  #Spvp-NP:  #SpvpAct:
       1         0          1          0         0          0
       #Svcc:     #Svpc:        #Ctrl:     Total:
       0          0             0             1
P2MP Details:

Type <CR> to continue, Q<CR> to stop:
DSPPNPORT       (P=Persistent, NP=Non-Persistent, Pa = Party, Act=Active)
Type   #Root:    #Leaf:     #Party:
svcc:  0         0          0
svpc:  0         0          0
       #Spvc-P:  #Spvc-NP:  #SpvcAct:  #Spvp-P:  #Spvp-NP:  #SpvpAct:
       0         0          0          0         0          0
       #SpvcPa-P:#SpvcPaAct:#SpvpPa-P: #SpvpPaAct:
       0         0          0          0
```

Managing Priority Bumping

Release 5.0 introduces a new feature called priority bumping. This feature, which is designed for enterprise networks, can automatically release lower priority connections to make resources available for routing a higher priority connection. Priority bumping occurs only when all of the following are true:

- The AvCR or available LCN count on an ingress or egress interface is too low to support a priority connection.
- The connection that needs routing has a higher priority than existing connections, and releasing the preconfigured number of lower priority connections will produce the needed resources.

The priority bumping feature uses the same priority values used for priority routing. The priority range is 0 to 15. Priority 0 is the highest priority, and priority 15 is the lowest. Priority 0 is used for routing control channels (RCCs) and cannot be assigned to other connection types. The valid range for priority configuration is 1 to 15. Routing priority is assigned to connections in either of the following ways:

- The routing priority is assigned to an SPVC or SPVP using the **addcon** or **cnfcon** commands.
- The routing priority is assigned to an interface using the **cnfpnportsig** command. When the routing priority is assigned to an interface, the configured priority applies to all SVCs that use the interface and any SPVCs or SPVPs for which the routing priority has been deleted. (This happens when the priority services information element (IE) is deleted or not supported on another node.)

The following sections describe the tasks for managing the priority bumping feature:

- Enabling, Configuring, and Disabling Priority Bumping
- Displaying the Priority Bumping Configuration
- Displaying Priority Bumping Statistics
- Resetting the Priority Bumping Statistics
- Displaying Priority Bumping Resource Usage

Enabling, Configuring, and Disabling Priority Bumping

When you enable priority bumping, you should enable it on all nodes in the network. If some nodes are running software released prior to Release 5, those nodes will respond as if priority bumping is disabled. When priority bumping is disabled on some nodes and not others, the enabled nodes will bump connections for higher priority connections, and those higher priority connections might be rejected at overloaded nodes that do not support priority bumping. This results in needless connection bumping for the lower priority connections.

When you enable connection bumping, you can specify a maximum number of *bumpable* connections and a maximum number of *concurrent bumps*. The maximum number of bumpable connections specifies how many lower priority connections can be bumped for a single higher priority connection. The range is 1 to 10, and the default is 10.

The maximum number of concurrent bumps specifies how many higher-priority connections can actively bump lower-priority connections at the same time. The range is 1 to 25, and the default is 25.

To enable and configure priority bumping, enter the **cnfndconnpribump** command as follows:

```
M8830_CH.2.PXM.a > cnfndconnpribump [-priorityBumping enable|disable] [-bumpable
<connections>] [-concurrent <bumps>]
```

To enable or disable priority bumping, include the -priorityBumping option with the appropriate keyword shown above. The -bumpable option specifies how many connections can be bumped for a single higher priority connection, and the range is 1 to 10 (default = 10). The -concurrent option defines how many bumping process can be in process at once, and that range is 1 to 25 (default 25).

The following example enables priority bumping and configures the node to allow up to 15 bumping processes to each bump up to 8 connections:

```
M8830_CH.2.PXM.a > cnfndconnpribump -priorityBumping enable -bumpable 8 -concurrent 15
```

To display the priority bumping configuration, enter the **dspndconnpribump** command as described in the next section.

Displaying the Priority Bumping Configuration

To display the priority bumping configuration, enter the **dspndconnpribump** command as shown in the following example:

```
M8830_CH.2.PXM.a > dspndconnpribump
Priority Bumping Admin State:Enable
Priority Bumping Oper State: Up
Max no. bumpable connections: 8
Max no. concurrent connections: 15
```

The configuration values shown are the same as those for the **cnfndconnpribump** command described earlier. The *Priority Bumping Oper State* line shows whether or not priority bumping is operational. When priority bumping is enabled, there is a delay during which the feature is brought up. If you enable priority bumping and the operational state is *down*, wait a few minutes and check the state again. The bringup time is proportional to the number of active connections on the switch.

Displaying Priority Bumping Statistics

To display the priority bumping statistics, enter the **dsppribumpstats** command as shown in the following example:

```
M8830_CH.2.PXM.a > dsppribumpstats
Nodal Priority Bumping Stats
=======================================
Priority   Bumping Conns   Bumped Conns
0           0               0
1           0               0
2           0               0
3           0               0
4           0               0
5           0               0
6           0               0
7           0               0
8           0               0
9           0               0
10          0               0
11          0               0
12          0               0
13          0               0
14          0               0
15          0               0
```

The *Priority* column lists the available connection priorities. The *Bumping Conns* column shows how many connections at each priority level have bumped other connections, and the *Bumped Conns* column shows how many connections have been bumped to support the bumping connections.

Resetting the Priority Bumping Statistics

To reset the priority bumping statistics to zero, enter the **clrpribumpstats** command as shown in the following example:

```
M8830_CH.2.PXM.a > clrpribumpstats

 Clearing Priority Bumping Stats for all ports and Nodal Priority bumping stats
```

To verify that the statistic counters have been reset, enter the **dsppribumpstats** command as described in the previous section.

Displaying Priority Bumping Resource Usage

To display the priority bumping resources in use, enter the **dsppnportpribumprsrc** command as follows:

```
M8830_CH.2.PXM.a > dsppnportpribumprsrc <portid>
```

Replace the *portid* variable with a port number in the format: [*shelf.*]*slot*[:*subslot*].*port*[:*subport*]. To display available port IDs, enter the **dsppnports** command. The following example shows the port resources for port 1:2.1:1:

```
M8830_CH.2.PXM.a > dsppnportpribumprsrc 1:2.1:1
Priority     usedCR Xmt     usedCR Rcv   # of Conns
---------------------------------------------------
0            0              0            0
1            0              0            0
2            0              0            0
3            0              0            0
4            0              0            0
5            0              0            0
6            0              0            0
7            0              0            0
8            5120           5120         2
9            0              0            0
10           0              0            0
11           0              0            0
12           0              0            0
13           0              0            0
14           0              0            0
15           0              0            0
```

The *Priority* column lists the available connection priorities. The *usedCR Xmt* and *usedCR Rcv* columns show the bandwidth in use at each priority level in the transmit and receive directions, respectively. The *# of Conns* column shows the number of logical connection numbers reserved at each priority level.

Managing Connection Grooming

Connection grooming is the process of checking each connection to determine if a more efficient route is available. If a prospective new route is significantly better than the incumbent route, the connection is rerouted.

The Cisco MGX Release 5 software provides many features for implementing and managing connection grooming. The following sections describe these connection grooming topics:

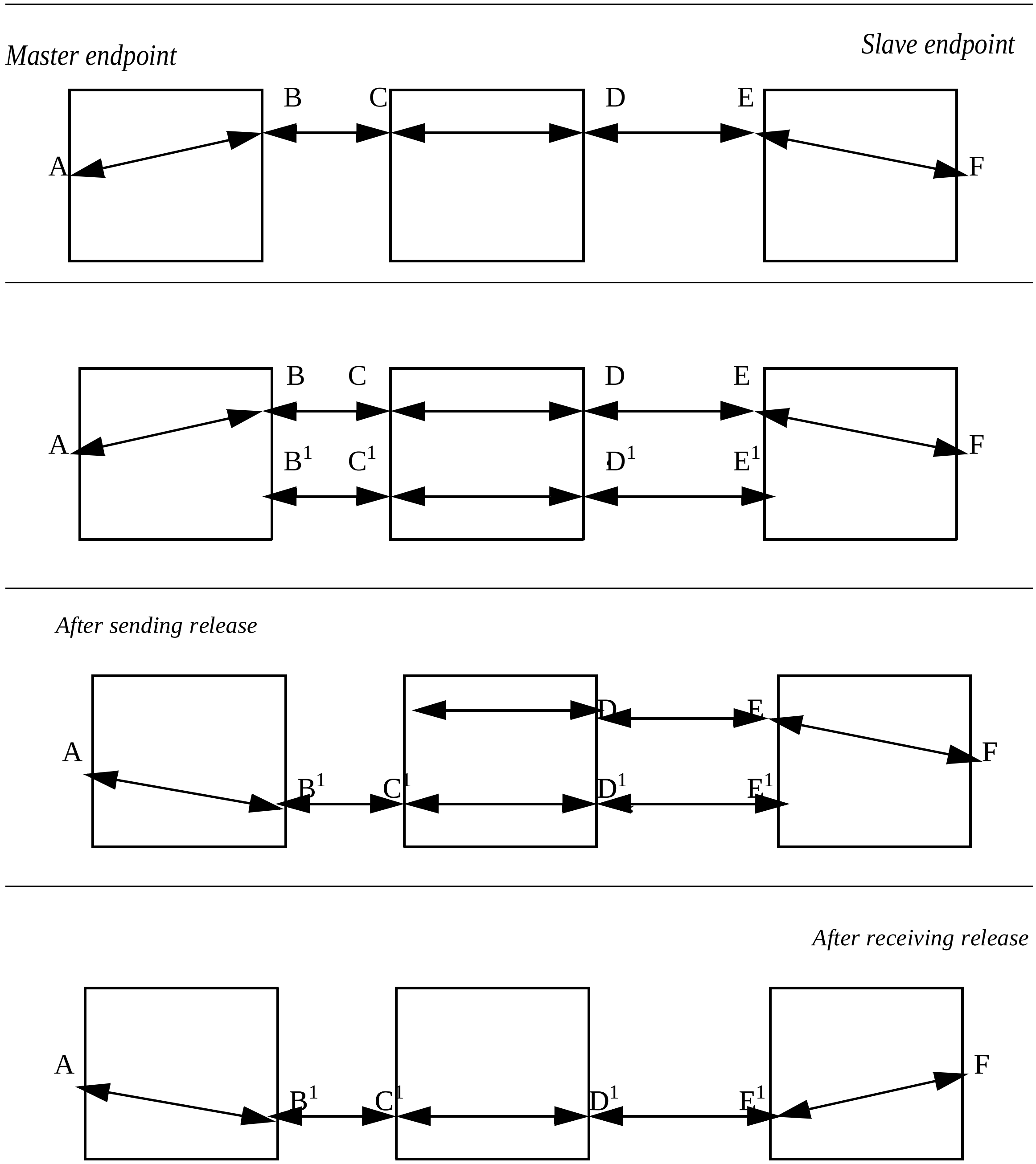
- How Grooming Reroutes Connections
- Enabling and Disabling Soft Rerouting for Grooming
- Configuring Scheduled Grooming
- Manually Grooming Connections
- Configuring the Grooming Thresholds
- Configuring Orderly Grooming
- Configuring the Trunk Utilization Limit
- Displaying Grooming Configuration Parameters
- Displaying Grooming Configuration Statistics
- Configuring the AIS Delay
- Enabling and Disabling the Soft Reroute IE

How Grooming Reroutes Connections

Cisco MGX switches use two different reroute methods for grooming connections. Prior to Release 5, Cisco MGX switches use only the hard reroute method. During a hard reroute, a connection that has been selected for grooming is disconnected, and then a new connection is built over a new route. The disadvantage to this approach is that the new connection is not validated before the original connection is released. Another disadvantage is that even when the new connection is operational, hard rerouting interrupts connection service for a longer period of time than soft rerouting. The hard reroute method is sometimes called the break-before-make method.

Soft rerouting is introduced in Release 5 Cisco MGX switches for grooming of P2P connections. During a soft reroute, a new connection is established and validated before the existing or incumbent connection is released. When the new connection is ready for use, the switch changes to the new connection with a momentary interruption of service. When the connection is established on the new connection, the incumbent connection is released. The soft reroute method is sometimes called the make-before-break method. Figure 8-2 illustrates how a soft reroute operates.

Figure 8-2 Soft Reroute Method of Connection Grooming



The first panel in Figure 8-2 show the incumbent connection. The master endpoint is A and the slave endpoint is F. Endpoints B, C, D, and E are NNI endpoints. On MGX switches, only master endpoints can initiate grooming. After the incumbent connection is chosen for rerouting, a new connection is established using NNI endpoints B^1, C^1, D^1, and E^1 as shown in the second panel. When the new connection is ready, the master endpoint sends a release message to the slave endpoint and switches to the new connection as shown in the third panel. When the slave endpoint receives the release, it switches to the new connection, and the reroute is complete.

Softrerouting is disabled by default. For soft rerouting to work properly, you must enable soft rerouting and the nodes that host the master and slave endpoints must run Cisco MGX software Release 5 or later. The first time a connection is rerouted, the master endpoint queries the slave endpoint to determine if it supports soft rerouting. The first reroute is a hard reroute, but if the master learned that the slave supports soft reroute, all future reroutes are soft reroutes. If either the master endpoint or the slave endpoint do not support soft rerouting, all grooming for that connection used the hard reroute method.

Note Cisco MGX switches use soft rerouting for grooming P2P connections. P2MP connections cannot be groomed.

Enabling and Disabling Soft Rerouting for Grooming

Soft rerouting is described in the previous section, “How Grooming Reroutes Connections.” To enable or disable soft rerouting for connection grooming, enter the **cnfndrteopt** command as follows:

```
M8850_LA.7.PXM.a > cnfndrteopt [-softreroute enable | disable]
```

To enable soft rerouting, include the **-softreroute enable** option. To disable soft rerouting, specify **-softreroute disable**.

Note The **cnfndrteopt** command configures other features that are described later in this chapter. Table 8-15 describes the other **cnfndrteopt** command parameters.

The following example enables soft rerouting and uses the **dspndrteopt** command to verify the configuration change:

```
PXM1E_SJ.7.PXM.a > cnfndrteopt -softreroute enable

PXM1E_SJ.7.PXM.a > dspndrteopt
Nodal Route Optimization Parameters:
------------------------------------
Orderly Grooming Feature:              Enabled
Orderly Grooming Batch Size:           20
Orderly Grooming Timeout:              300
Trunk Util Threshold Percent:          85
Soft Reroute:                          Enabled
```

Configuring Scheduled Grooming

Scheduled grooming automatically grooms one or more port connections at specific times. You can groom a specific connection by specifying the port ID, VPI, and VCI, groom a range of connections, or groom all connections on the port. To automatically groom the port connections at specified times, enter the **cnfrteopt** command as follows:

```
M8850_LA.7.PXM.a > cnfrteopt <portid> <flag> [-range <starting-vpi/vci..ending-vpi/vci>]
[-interval (range=10..10000) (default=60)] [-tod <time-of-day>] [-weekday <day-of-week>]
```

Table 8-10 describes the **cnfrteopt** command parameters.

Table 8-10 Parameters for cnfrteopt Command

Parameter	Description
portid	Root endpoint port identifier, in the format [shelf.]slot[:subslot].port[:subport]. To display a list of the available ports, enter the **dsppnports** command.
flag	The flag parameter enables or disables automatic grooming. To enable automatic grooming, replace the flag variable with **enable**. To disable automatic grooming, replace the flag variable with **disable**.
-range	When the -range option is specified, scheduled grooming occurs on only those port connections in the specified VPI and VCI range. Enter the range using the format: *starting-vpi*/*vci*..*ending-vpi*/*vci*. You must enter two periods between the starting VPI/VCI and the ending VPI/VCI. The slash character is required between the VPI and VCI in each VPI/VCI pair. The default range is 0/0..4095/65535.
-interval	When the -interval option is specified, scheduled grooming repeats at the specified interval during the scheduled times on the scheduled days. For example, if the interval is set to 30, grooming for this port will be repeated every 30 minutes during the scheduled grooming times. Enter the interval in minutes. The interval range is 10 to 10000 minutes. The default is 60 minutes.
-tod	When the -tod option is specified, scheduled grooming occurs during only those times specified in the time-of-day range. Enter the range using the format: *start-time*..*end-time*. You must enter two periods between the start and the end times. Enter each time in the format: HH:MM. The default range is 00:00..23:59, which allows scheduled grooming at all times.
-weekday	When the -weekday option is specified, scheduled grooming occurs on only those days that are specified. Enter the weekday schedule using the format: SMTWTFS. The letters are abbreviations for the days of the week beginning with Sunday. To enable scheduled grooming on a specific day of the week, enter the letter for that day. To disable scheduled grooming on a specific day of the week, enter a period instead of the letter. The default weekday schedule is SMTWTFS, which allows scheduled grooming on all days.

The following example enables scheduled grooming on port 6:1.3:13 using the default values and uses the **dsprteoptcnf** command to display the configured values:

```
M8850_LA.7.PXM.a > cnfrteopt 6:1.3:13 enable

M8850_LA.7.PXM.a > dsprteoptcnf 6:1.3:13
Route Optimization Configuration:
---------------------------------
Percentage Reduction AW CBR:      30
Percentage Reduction AW RTVBR:    30
Percentage Reduction AW NRTVBR:   30
Percentage Reduction AW ABR:      30
Percentage Reduction AW UBR:      30
Percentage Reduction CTD CBR:     30
Percentage Reduction CTD RTVBR:   30
Percentage Reduction CDV CBR:     30
Percentage Reduction CDV RTVBR:   30
Absolute Cost AW CBR:             0
Absolute Cost AW RTVBR:           0
Absolute Cost AW NRTVBR:          0
Absolute Cost AW ABR:             0
Absolute Cost AW UBR:             0
Absolute Cost CTD CBR :           0
Absolute Cost CTD RTVBR :         0
Absolute Cost CDV CBR:            0
Absolute Cost CDV RTVBR:          0
Port           Enable   VPI/VCI Range    Interval   Time Range   Weekday(s)
6:1.3:13       yes      all              60         anytime      all
```

The next example disables the configuration completed in the previous example:

```
M8850_LA.7.PXM.a > cnfrteopt 6:1.3:13 disable

M8850_LA.7.PXM.a > dsprteoptcnf 6:1.3:13
Route Optimization Configuration:
---------------------------------
Percentage Reduction AW CBR:      30
Percentage Reduction AW RTVBR:    30
Percentage Reduction AW NRTVBR:   30
Percentage Reduction AW ABR:      30
Percentage Reduction AW UBR:      30
Percentage Reduction CTD CBR:     30
Percentage Reduction CTD RTVBR:   30
Percentage Reduction CDV CBR:     30
Percentage Reduction CDV RTVBR:   30
Absolute Cost AW CBR:             0
Absolute Cost AW RTVBR:           0
Absolute Cost AW NRTVBR:          0
Absolute Cost AW ABR:             0
Absolute Cost AW UBR:             0
Absolute Cost CTD CBR :           0
Absolute Cost CTD RTVBR :         0
Absolute Cost CDV CBR:            0
Absolute Cost CDV RTVBR:          0
Port           Enable   VPI/VCI Range    Interval   Time Range   Weekday(s)
6:1.3:13       no       all              60         anytime      all
```

This example schedules grooming to occur at the default interval (60 minutes) between midnight and 4 a.m. on Mondays, Wednesdays, and Fridays:

```
M8850_LA.7.PXM.a > cnfrteopt 6:1.3:13 enable -tod 00:00..04:00 -weekday .M.W.F.

M8850_LA.7.PXM.a > dsprteoptcnf 6:1.3:13
Route Optimization Configuration:
---------------------------------
Percentage Reduction AW CBR:      30
Percentage Reduction AW RTVBR:    30
Percentage Reduction AW NRTVBR:   30
Percentage Reduction AW ABR:      30
Percentage Reduction AW UBR:      30
Percentage Reduction CTD CBR:     30
Percentage Reduction CTD RTVBR:   30
Percentage Reduction CDV CBR:     30
Percentage Reduction CDV RTVBR:   30
Absolute Cost AW CBR:             0
Absolute Cost AW RTVBR:           0
Absolute Cost AW NRTVBR:          0
Absolute Cost AW ABR:             0
Absolute Cost AW UBR:             0
Absolute Cost CTD CBR :           0
Absolute Cost CTD RTVBR :         0
Absolute Cost CDV CBR:            0
Absolute Cost CDV RTVBR:          0
Port           Enable   VPI/VCI Range    Interval   Time Range   Weekday(s)
6:1.3:13       yes      all              60         00:00..04:00 .M.W.F.
```

Manually Grooming Connections

Manual grooming, which is also called on-demand grooming, grooms one or more port connections immediately. You can groom a specific connection by specifying the port ID, VPI, and VCI, groom a range of connections, or groom all connections on the port. To manually groom the connections on an port, enter the **optrte** command as follows:

```
M8850_LA.7.PXM.a > optrte <portid> [-vpi <vpi>] [-vci <vci>] [-range
<starting-vpi/vci..ending-vpi/vci>]
```

Table 8-11 describes the **optrte** command parameters.

Table 8-11 Parameters for optrte Command

Parameter	Description
portid	Root endpoint port identifier, in the format [shelf.]slot[:subslot].port[:subport]. To display a list of the available ports, enter the **dsppnports** command.
vpi	When the -vpi option is specified, the **optrte** command grooms only those port connections that use the specified VPI. To display a list of connections that includes the VPI and VCI for each connection, enter the **dspcons** command.

Table 8-11 Parameters for optrte Command (continued)

vci	When the -vci option is specified, the **optrte** command grooms only those port connections that use the specified VCI. To display a list of connections that includes the VPI and VCI for each connection, enter the **dspcons** command.
-range	When the -range option is specified, the **optrte** command grooms only those port connections in the specified VPI and VCI range. Enter the range using the format: *starting-vpi*/*vci*..*ending-vpi*/*vci*. You must enter two periods between the starting VPI/VCI and the ending VPI/VCI. The slash character is required between the VPI and VCI in each VPI/VCI pair.

The following example grooms all connections on port 30.1:

```
M8850_LA.7.PXM.a > optrte 30.1
```

The next example grooms a single connection on port 30.1:

```
M8850_LA.7.PXM.a > optrte 30.1 -vpi 30 -vci 119
```

This example grooms all connections in the range of VPI/VCI 100/100 and VPI/VCI 200/200 on port 6:1.3:13:

```
M8850_LA.7.PXM.a > optrte 6:1.3:13 -range 100/100..200/200
```

Configuring the Grooming Thresholds

Cisco MGX Release 5 software introduces more options for determining when to reroute a connection during grooming. Prior to Release 5, the only grooming threshold was cumulative administrative weight. In Release 5, you can define percentage reduction values and absolute threshold gains for the following traffic metrics:

- Administrative Weight (AW)
- Cell transfer delay (CTD)
- Cell delay variation (CDV)

The threshold gains can be defined for all applicable ATM service types as shown in Table 8-12.

Table 8-12 Supported Grooming Thresholds

	Percentage Reduction			Absolute		
Service Category	**AW**	**CTD**	**CDV**	**AW**	**CTD**	**CDV**
CBR	Yes	Yes	Yes	Yes	Yes	Yes
rtVBR	Yes	Yes	Yes	Yes	Yes	Yes
nrtVBR	Yes	N/A	N/A	Yes	N/A	N/A
UBR	Yes	N/A	N/A	Yes	N/A	N/A
ABR	Yes	N/A	N/A	Yes	N/A	N/A

When the grooming operation evaluates a connection for rerouting, it uses just one of the three available metrics. The chosen metric is based on the metrics configured for the connection. You can view the configuration of connection metrics by entering the **dspcon** command for the connection. Connection metrics that display -1 are not configured. In the following example, none of the three metrics are configured.

```
PXM1E_SJ.7.PXM.a > dspcon 7:2.12:12 135 135
Port                 Vpi Vci            Owner      State      Persistency
---------------------------------------------------------------------------
Local  7:2.12:12      135.135            MASTER     OK         Persistent
       Address: 47.00918100000000001a533377.000001073b0c.00
       Node name: PXM1E_SJ
Remote 7:2.11:11      125.125            SLAVE      OK         Persistent
       Address: 47.00918100000000001a533377.000001073b0b.00
       Node name: PXM1E_SJ

-------------------- Provisioning Parameters --------------------
Connection Type: VCC          Cast Type: Point-to-Point
Service Category: CBR         Conformance: CBR.1
Bearer Class: BCOB-X
Last Fail Cause: No Fail                          Attempts: 0
Continuity Check: Disabled    Frame Discard: Disabled
L-Utils: 100   R-Utils: 100   Max Cost: -1    Routing Cost: 0 (N/A)
OAM Segment Ep: Enabled
Pref Rte Id: 0                Directed Route: No
Priority: 8                   Num Parties: -

---------- Traffic Parameters ----------
Values: Configured (Signalled)

Type <CR> to continue, Q<CR> to stop:
Tx PCR:  50        (50        )     Rx PCR:  50        (50        )
Tx CDVT: 250000    (250000    )
Tx CDV:  -1        (-1        )     Rx CDV:  -1        (-1        )
Tx CTD:  -1        (-1        )     Rx CTD:  -1        (-1        )

-------------------- Preferred Route Parameters------------------
Currently on preferred route: N/A

-------------------- Others ------------------------------------
SM: Record Number: 2, ATM

-------------------- Soft Reroute Parameters------------------
Negotiated Slave Soft Reroute Capability: DISABLE
Soft Reroute Last Cause: N/A.  Soft Reroute is not performed yet.
```

In the example above, the transmit and receive values for CDV and CTD are -1. Also the Max Cost value is set to -1. The Max Cost of a connection is defined during connection configuration and specifies the maximum permissible sum of the administrative weight (AW) on each line along that connection.

The default configuration uses the AW metric for connection grooming. However, you can use the **cnfcon** command to configure a connection to use maximum cost, CTD, or CDV metrics. If only one of the metrics is configured, that metric is evaluated. If multiple metrics are configured, the metric with the highest priority is evaluated. The highest priority is AW, which is selected whenever a maximum cost is configured. The second highest priority is CTD, and the lowest priority is CDV. Table 8-13 shows how metrics are chosen based on the connection configuration.

Table 8-13 Grooming Metric Selection

Connection Configured Metric			Selected Metric
Max. Cost	CTD	CDV	
No	No	No	AW
No	No	Yes	CDV
No	Yes	No	CTD
No	Yes	Yes	CTD
Yes	No	No	AW
Yes	No	Yes	AW
Yes	Yes	No	AW
Yes	Yes	Yes	AW

The grooming operation uses both the percentage and absolute thresholds to determine if a prospective new route is better than the incumbent route. If the new route meets both criteria, the connection is rerouted. For example, if the incumbent connection cost is 1000, the absolute threshold is 100 and the percentage reduction is 5, the connection will be rerouted only if the new connection cost is less than or equal to 900. To calculate the cost reduction based on the absolute threshold, subtract 100 from the incumbent connection cost of 1000. To calculate the reduction based on the percentage threshold, multiply the connection cost by 5 percent (1000*5/100 = 50). Because the absolute threshold metric requires the larger cost reduction in this example, the absolute threshold of 100 is used to determine if rerouting should take place.

To set the grooming thresholds used for scheduled and manual grooming, enter the **cnfrteoptthresh** command as follows:

```
M8850_LA.7.PXM.a > cnfrteoptthresh <type> [-awcbr <value>] [-awrtvbr <value>]
[-awnrtvbr <value>] [-awubr <value>] [-awabr <value>] [-ctdcbr <value>]
[-ctdrtvbr <value>] [-cdvcbr <value>] [-cdvrtvbr <value>]
```

Table 8-14 describes the **cnfrteoptthresh** command parameters.

Table 8-14 Parameters for cnfrteoptthresh Command

Parameter	Description
type	Grooming threshold parameter type to be set. You can set either the grooming percentage (enter **per**) or the absolute value (enter **abs**). To change both the percentage and absolute value, you must enter the **cnfrteoptthresh** command twice, specifying a different threshold parameter type each time.
-awcbr	Use the -awcbr option to set thresholds for the grooming CBR connections based on cumulative AW. When the type parameter is set to **per**, the range is 0 to 100 percent. When the type parameter is set to **abs**, the range is 0 to 4294967295. The default values are percentage reduction = 30 and absolute cost = 0.

Table 8-14 Parameters for cnfrteoptthresh Command (continued)

-awrtvbr	Use the -awrtvbr option to set thresholds for the grooming rtVBR connections based on cumulative AW. When the type parameter is set to **per**, the range is 0 to 100 percent. When the type parameter is set to **abs**, the range is 0 to 4294967295. The default values are percentage reduction = 30 and absolute cost = 0.
-awnrtvbr	Use the -awnrtvbr option to set thresholds for the grooming nrtVBR connections based on cumulative AW. When the type parameter is set to **per**, the range is 0 to 100 percent. When the type parameter is set to **abs**, the range is 0 to 4294967295. The default values are percentage reduction = 30 and absolute cost = 0.
-awubr	Use the -awnrtvbr option to set thresholds for the grooming UBR connections based on cumulative AW. When the type parameter is set to **per**, the range is 0 to 100 percent. When the type parameter is set to **abs**, the range is 0 to 4294967295. The default values are percentage reduction = 30 and absolute cost = 0.
-awabr	Use the -awabr option to set thresholds for the grooming ABR connections based on cumulative AW. When the type parameter is set to **per**, the range is 0 to 100 percent. When the type parameter is set to **abs**, the range is 0 to 4294967295. The default values are percentage reduction = 30 and absolute cost = 0.
-ctdcbr	Use the -ctdcbr option to set thresholds for the grooming CBR connections based on cell transfer delay. When the type parameter is set to **per**, the range is 0 to 100 percent. When the type parameter is set to **abs**, the range is 0 to 4294967295. The default values are percentage reduction = 30 and absolute cost = 0.
-ctdrtvbr	Use the -ctdrtvbr option to set thresholds for the grooming rtVBR connections based on cell transfer delay. When the type parameter is set to **per**, the range is 0 to 100 percent. When the type parameter is set to **abs**, the range is 0 to 4294967295. The default values are percentage reduction = 30 and absolute cost = 0.
-cdvcbr	Use the -cdvcbr option to set thresholds for the grooming CBR connections based on cell transfer delay. When the type parameter is set to **per**, the range is 0 to 100 percent. When the type parameter is set to **abs**, the range is 0 to 4294967295. The default values are percentage reduction = 30 and absolute cost = 0.
-cdvrtvbr	Use the -cdvrtvbr option to set thresholds for the grooming rtVBR connections based on cell delay variation. When the type parameter is set to **per**, the range is 0 to 100 percent. When the type parameter is set to **abs**, the range is 0 to 4294967295. The default values are percentage reduction = 30 and absolute cost = 0.

The following example sets the percentage reduction and absolute threshold for CBR connections that reroute based on cumulative AW. This example uses the **dsprteoptcnf** command to show the change in grooming threshold parameter values.

```
M8850_LA.7.PXM.a > cnfrteoptthresh per -awcbr 20

M8850_LA.7.PXM.a > cnfrteoptthresh abs -awcbr 5

M8850_LA.7.PXM.a > dsprteoptcnf
Route Optimization Configuration:
---------------------------------
Percentage Reduction AW CBR:      20
Percentage Reduction AW RTVBR:    30
Percentage Reduction AW NRTVBR:   30
Percentage Reduction AW ABR:      30
Percentage Reduction AW UBR:      30
Percentage Reduction CTD CBR:     30
Percentage Reduction CTD RTVBR:   30
Percentage Reduction CDV CBR:     30
Percentage Reduction CDV RTVBR:   30
Absolute Cost AW CBR:             5
Absolute Cost AW RTVBR:           0
Absolute Cost AW NRTVBR:          0
Absolute Cost AW ABR:             0
Absolute Cost AW UBR:             0
Absolute Cost CTD CBR :           0
Absolute Cost CTD RTVBR :         0
Absolute Cost CDV CBR:            0
Absolute Cost CDV RTVBR:          0
Port           Enable   VPI/VCI Range    Interval   Time Range   Weekday(s)
7.35           no       all              60         anytime      all
7.36           no       all              60         anytime      all
7.37           no       all              60         anytime      all
7.38           no       all              60         anytime      all
13.1           no       all              60         anytime      all
30.1           no       all              60         anytime      all
30.2           no       all              60         anytime      all
6:1.3:13       yes      all              60         00:00..04:00 .M.W.F.
```

Configuring Orderly Grooming

Orderly grooming is introduced in Cisco MGX Release 5 software. Orderly grooming completes the reroute of a batch of connections before attempting to groom the next batch. In earlier software releases, the grooming process would analyze and release multiple connections, regardless of the number of connections that were waiting rerouting. With orderly grooming, a configured number of connections are released. When the batch of released connections are rerouted, the next batch of connections is analyzed. The default batch size for grooming is 1 connection, but the batch size can be configured for up to 1000 connections.

Orderly grooming is disabled by default. After you enable orderly grooming, all manual and scheduled grooming operations use orderly grooming. To enable and configure orderly grooming, enter the **cnfndrteopt** command as follows:

```
M8850_LA.7.PXM.a > cnfndrteopt [-og enable | disable] [-ogbatchsz size]
[-ogtimeout timeout]
```

Table 8-15 describes the **cnfndrteopt** command parameters.

Note The **cnfndrteopt** command configures other features that are described later in this chapter.

Table 8-15 Parameters for cnfndrteopt Command

Parameter	Description
-og	Use the -og option to enable or disable orderly grooming. To enable orderly grooming, enter **enable**. To disable orderly grooming, enter **disable**. The default configuration disables orderly grooming.
-ogbatchsz	Use the -ogbatchsz option to define a batch size for orderly grooming. Enter the number of connections to be groomed as a batch. The batch size range is 1 to 1000, and the default batch size is 1.
-ogtimeout	Use the -ogtimeout option to configure the batch processing period for orderly grooming. If the grooming operation has not completed for a batch by the end of the timeout period, grooming starts on the next batch. Enter the number of seconds for the period. The default setting is 60 seconds.
-trkutil	Use the -trkutil option to set a maximum trunk utilization limit for grooming. Enter a number in the range of 5 to 100 percent. The default setting is 100 percent.
-softreroute	Use the -softreroute option to enable or disable soft rerouting during grooming. To enable soft rerouting, enter **enable**. To disable soft rerouting, enter **disable**. The default configuration disables soft rerouting.

The following example enables orderly grooming, sets the batch size to 20, and sets the batch processing period to five minutes. The **dspndrteopt** command displays the configuration settings.

```
PXM1E_SJ.7.PXM.a > cnfndrteopt -og enable -ogbatchsz 20 -ogtimeout 300

PXM1E_SJ.7.PXM.a > dspndrteopt
Nodal Route Optimization Parameters:
------------------------------------
Orderly Grooming Feature:              Enabled
Orderly Grooming Batch Size:           20
Orderly Grooming Timeout:              300
Trunk Util Threshold Percent:          100
Soft Reroute:                          Disabled
```

Configuring the Trunk Utilization Limit

The trunk utilization limit feature is introduced in Release 5. The purpose of this feature is to prevent the grooming of connections to overloaded trunks.

Trunk utilization is the percentage of bandwidth is in use and is calculated by dividing the bandwidth in use by the maximum bandwidth available. The trunk utilization limit defines a trunk usage level above which grooming is denied for all connections that use trunks operating above the utilization limit. For example, if the trunk utilization limit is set at 80 percent and a candidate connection for grooming tries to use a target trunk operating at 85 percent usage, the candidate connection cannot be rerouted using that target trunk.

Note The trunk utilization limit applies only to connections being groomed. It does not apply to connections that are rerouted due to failures.

The default trunk utilization limit is 100 percent, and this imposes no restriction on grooming.

To change the trunk utilization limit, enter the **cnfndrteopt** command as follows:

```
M8850_LA.7.PXM.a > cnfndrteopt [-trkutil value]
```

The trunk utilization value range is 5 to 100 percent. Table 8-15 describes the **cnfndrteopt** command parameters.

Note The **cnfndrteopt** command configures other features that are described elsewhere in this chapter.

The following example changes the trunk utilization limit to 85 percent and displays the change with the **dspndrteopt** command.

```
PXM1E_SJ.7.PXM.a > cnfndrteopt -trkutil 85

PXM1E_SJ.7.PXM.a > dspndrteopt
Nodal Route Optimization Parameters:
------------------------------------
Orderly Grooming Feature:              Enabled
Orderly Grooming Batch Size:           20
Orderly Grooming Timeout:              300
Trunk Util Threshold Percent:          85
Soft Reroute:                          Disabled
```

Displaying Grooming Configuration Parameters

Two different commands display grooming configuration parameters. These commands are described in the following sections.

Displaying Threshold and Schedule Configuration Parameters

To display threshold and schedule configuration parameters, enter the **dsprteoptcnf** command as follows:

```
PXM1E_SJ.7.PXM.a > dsprteoptcnf [portid]
```

If you enter the command without any parameters, the switch displays the threshold settings and the configuration data for all ports. To display the configuration data for a single port, include the portid in the format: [shelf.]slot[:subslot].port[:subport]. To display the port numbers, enter the **dsprteoptcnf** command without any parameters, or enter the **dsppnports** command.

The following example shows the display when the **dsprteoptcnf** command is entered without a port ID.

```
PXM1E_SJ.7.PXM.a > dsprteoptcnf
Route Optimization Configuration:
---------------------------------
Percentage Reduction AW CBR:      30
Percentage Reduction AW RTVBR:    30
Percentage Reduction AW NRTVBR:   30
Percentage Reduction AW ABR:      30
Percentage Reduction AW UBR:      30
Percentage Reduction CTD CBR:     30
Percentage Reduction CTD RTVBR:   30
Percentage Reduction CDV CBR:     30
Percentage Reduction CDV RTVBR:   30
Absolute Cost AW CBR:             0
Absolute Cost AW RTVBR:           0
Absolute Cost AW NRTVBR:          0
Absolute Cost AW ABR:             0
Absolute Cost AW UBR:             0
Absolute Cost CTD CBR :           0
Absolute Cost CTD RTVBR :         0
Absolute Cost CDV CBR:            0
Absolute Cost CDV RTVBR:          0
Port           Enable   VPI/VCI Range    Interval   Time Range   Weekday(s)
1.1            no       all              60         anytime      all
4.1            no       all              60         anytime      all
4.2            no       all              60         anytime      all
6.1            no       all              60         anytime      all
7.35           no       all              60         anytime      all
7.36           no       all              60         anytime      all
7.37           no       all              60         anytime      all
7.38           no       all              60         anytime      all
9.2            no       all              60         anytime      all
11.1           no       all              60         anytime      all
11.5           no       all              60         anytime      all
28.1           no       all              60         anytime      all
7:2.11:11      no       all              60         anytime      all
7:2.12:12      no       all              60         anytime      all
```

The next example shows the **dsprteoptcnf** command display for a specific port.

```
PXM1E_SJ.7.PXM.a > dsprteoptcnf 7:2.12:12
Route Optimization Configuration:
---------------------------------
Percentage Reduction AW CBR:      30
Percentage Reduction AW RTVBR:    30
Percentage Reduction AW NRTVBR:   30
Percentage Reduction AW ABR:      30
Percentage Reduction AW UBR:      30
Percentage Reduction CTD CBR:     30
Percentage Reduction CTD RTVBR:   30
Percentage Reduction CDV CBR:     30
Percentage Reduction CDV RTVBR:   30
Absolute Cost AW CBR:             0
Absolute Cost AW RTVBR:           0
Absolute Cost AW NRTVBR:          0
Absolute Cost AW ABR:             0
Absolute Cost AW UBR:             0
Absolute Cost CTD CBR :           0
Absolute Cost CTD RTVBR :         0
Absolute Cost CDV CBR:            0
Absolute Cost CDV RTVBR:          0
Port           Enable   VPI/VCI Range    Interval   Time Range   Weekday(s)
7:2.12:12      no       all              60         anytime      all
```

Displaying Nodal Grooming Configuration Parameters

To display nodal grooming configuration parameters, enter the **dspndrteopt** command as shown in the following example:

```
PXM1E_SJ.7.PXM.a > dspndrteopt
Nodal Route Optimization Parameters:
------------------------------------
Orderly Grooming Feature:              Enabled
Orderly Grooming Batch Size:           20
Orderly Grooming Timeout:              300
Trunk Util Threshold Percent:          85
Soft Reroute:                          Enabled
```

Displaying Grooming Configuration Statistics

To display the current grooming statistics, enter the **dsprteoptstat** command as shown in the following example:

```
PXM1E_SJ.7.PXM.a > dsprteoptstat
Route Optimization Status:
----------------------------------
Req=Requests, Eval=Evals, Att=Attempts
Orderly Grooming: Rrt=Reroutes, Tme=TimedOuts, Can=Cancels
Soft Reroute: Att=Attempts, FIc=Failed Incumbent, Lcb=Late CallBk
              Rrt=Reroutes, FRr=Failed Rerouting, Lrl=Late Release

                                          Orderly Grooming  Soft Reroute
                                          ----------------  ----------------
Port          Status      Req   Eval  Att   Rrt    Tme    Can    Att    FIc    Lcb
                                                                 Rrt    FRr    Lrl
9.2           done        0     0     0     0      0      0      0      0      0
                                                                 0      0      0
11.1          done        0     0     0     0      0      0      0      0      0
                                                                 0      0      0
11.5          done        0     0     0     0      0      0      0      0      0
                                                                 0      0      0
```

The grooming statistics column head abbreviations are described above the command display.

Configuring the AIS Delay

An alarm indication signal (AIS) is sent to CPE at each end of a connection when the switch detects a connection alarm. The derouting of a connection triggers the AIS signal, and depending on the CPE configuration, the derouting may trigger a switchover of the CPE to backup facilities. The AIS delay timer feature is designed to delay a locally generated AIS event long enough that a new connection can be established during grooming. If the new connection is established before the end of the AIS delay, no AIS is generated.

Note The AIS delay does not affect AIS signals generated on other switches and forwarded to this switch.

When configuring the AIS delay, consider the following guidelines:

- The AIS delay timer applies only to persistent (double-ended) P2P connections.
- The AIS delay timer only applies during connection grooming. If an AIS is generated for another reason, such as a failed link, the AIS is sent immediately.
- We recommend that the AIS delay feature remain disabled until all network nodes have been upgraded to Cisco MGX software Release 4 or later.
- During switchover, the configured AIS delay may be doubled as it is applied to one PXM and then the other.

The AIS delay feature is disabled by default. To change the AIS delay period, enter the **cnfaisdelaytimer** command as follows:

```
PXM1E_SJ.7.PXM.a > cnfaisdelaytimer <timer_value>
```

Replace the *timer_value* variable with a number in the range of 0 to 60. If you enter 0, the AIS delay is disabled. To enable the AIS delay and select a delay time, enter a number in the range of 1 to 60 seconds.

The following example enables the AIS delay timer, sets the delay to 15 seconds, and uses the **dspaisdelaytimer** command to display the configuration change.

```
PXM1E_SJ.7.PXM.a > cnfaisdelaytimer 15

PXM1E_SJ.7.PXM.a > dspaisdelaytimer
AIS Delay Timer:15 seconds
```

Enabling and Disabling the Soft Reroute IE

When soft rerouting is enabled and the grooming operation sets up a new connection, the soft reroute information element (IE) is forwarded along the new route as part of the soft reroute capability negotiation. If any switch along the call route cannot accept the soft reroute IE, you can block forwarding of the IE on the appropriate interface.

Use the following procedure to manage the forwarding of the soft reroute IE.

Step 1 Establish a configuration session using a user name with GROUP1 privileges or higher.

Step 2 Enter the **dsppnportie** <*portid*> command as follows to display the current configuration for the soft reroute IE feature. Replace <*portid*> with the appropriate port identifier in the format *slot*:*bay.line*:*ifnum*.(You can use the **dsppnports** command to display port numbers in use.)

```
PXM1E_SJ.7.PXM.a > dsppnportie 7:2.11:11

IE Options for port : 7:2.11:11

PS IE Option     : auto
CUG IE Option    : auto
Soft Reroute IE Option    : auto
```

Step 3 Enter the **cnfpnportie** command as follows to change the soft rereoute IE configuration.

```
M8850_LA.7.PXM.a > cnfpnportie <portid> [-srie auto|allowed|disallowed]
```

Replace <*portid*> with the port identifier in the format *slot:bay.port:interface*. You can view the configured port numbers by entering the **dsppnports** command.

The default configuration (**auto**) automatically blocks IE forwarding on UNI and IISP interfaces and forwards the IE on NNI and AINI interfaces. You can also configure any port to allow (**allowed**) or disallow (**disallowed**) soft reroute IE forwarding.

Step 4 To verify your change, enter the **dsppnportie** command as described in Step 2 of this procedure.

Displaying Node Configuration Information

The following sections describe commands that display PNNI configuration information.

Displaying the PNNI Node Table

Once a PNNI node is configured, enter the **dsppnni-node** command to show the WAN nodal table. The node list is displayed in ascending order of each node index, all with one setting the node to the lowest PNNI hierarchy.

The significant information that will display is as follows:

- Node index
- Node name
- Node level (56 for all nodes until multiple peer groups are supported)
- Restricted transit—a flag that can prevent PNNI routing from transmitting this node
- Branching restricted—a flag that can prevent cpu-intensive branching at this node
- Admin status—up/down
- Operational status—up/down
- Nontransit for PGL election—a flag that indicates that node's level of eligibility as a PGL
- Node id—The 22-byte PNNI logical identification
- ATM address
- pg id—Peer group ID

The following example shows the report for this command:

```
mgx8830a.1.PXM.a >  dsppnni-node
node index: 1                      node name: Geneva
   Level...............        56     Lowest..............      true
   Restricted transit..       off     Complex node........       off
   Branching restricted        on
   Admin status........        up     Operational status..        up
   Non-transit for PGL election..       off
   Node id...............56:160:47.00918100000000030ff0fef38.0030ff0fef38.01
   ATM address...........47.00918100000000030ff0fef38.0030ff0fef38.01
   Peer group id.........56:47.00.9181.0000.0000.0000.0000.00
mgx8830a.1.PXM.a >
```

Displaying the PNNI Summary Address

Use the **dsppnni-summary-addr** command to display PNNI summary addresses as follows:

```
mgx8830a.1.PXM.a >  dsppnni-summary-addr [node-index]
```

If you specify the node-index, this command displays the summary address prefixes of the node-index PNNI node.

If you do not specify the node-index, this command displays summary address prefixes for all local nodes on network.

Table 8-16 shows the objects displayed for the **dsppnni-summary-addr** command.

Table 8-16 Objects Displayed for dsppnni-summary-addr Command

Parameter	Description
node-index	The node index number assigned to a PNNI logical node on a network. Replace [*node-index*] with a number in the range from 1 to 65535.
addressprefix	The ATM address prefix assigned to the network.
prefixlength	The length of the summary address-prefix in number of bits, equal or less than 152 bits. Currently, the zero-length summary address is not supported.
-type	The type of the summary address.
-suppress	true = summary address is not advertised.
-state	The summary address state can be advertising, notadvertised, or inactive.

This example shows the **dsppnni-summary-addr** command line that displays the PNNI address prefixes.

```
mgx8830a.1.PXM.a > dsppnni-summary-addr

node index: 1
   Type..............    internal     Suppress..............   false
   State............. advertising
   Summary address........47.0091.8100.0000.0000.1a53.1c2a/104
```

Displaying System Addresses

The **dsppnsysaddr** command is more specific. This command displays the following list of addresses from the System Address Table:

- ilmi
- uni
- static
- host

The following example shows the report for this command:

```
mgx8830a.1.PXM.a > dsppnsysaddr
47.0091.8100.0000.0030.ff0f.ef38.0000.010b.180b.00/160
Type:     host     Port id:   17251106

47.0091.8100.0000.0030.ff0f.ef38.0000.010b.1816.00/160
Type:     host     Port id:   17251106

47.0091.8100.0000.0030.ff0f.ef38.0000.010b.1820.00/160
Type:     host     Port id:   17251106

47.0091.8100.0000.0030.ff0f.ef38.0000.010b.1821.00/160
Type:     host     Port id:   17251106

47.0091.8100.0000.0030.ff0f.ef38.0000.010d.1820.00/160
Type:     host     Port id:   17251106

47.0091.8100.0000.0030.ff0f.ef38.0000.010d.1821.00/160
Type:     host     Port id:   17251106

47.0091.8100.0000.0030.ff0f.ef38.0000.010d.1822.00/160
Type:     host     Port id:   17251106

47.0091.8100.0000.0030.ff0f.ef38.0000.010d.180b.00/160
Type:     host     Port id:   17251106

47.0091.8100.0000.0030.ff0f.ef38.0030.ff0f.ef38.01/160
Type:     host     Port id:   17251106

47.0091.8100.0000.0030.ff0f.ef38.0030.ff0f.ef38.99/160
Type:     host     Port id:   17251106

47.0091.8100.0000.0030.ff0f.ef38.1111.1101.0001.01/160
Type:     host     Port id:   17251106

47.0091.8100.0000.0050.0fff.e0b8/104
Type:   static     Port id:   17635339

39.6666.6666.6666.6666.6666.6666.6666.6666.6666/152
Type:      uni     Port id:   17504267

mgx8830a.1.PXM.a >
```

Displaying PNNI Interface Parameters

Enter the **dsppnni-intf** command to display the service category-based administrative weight and aggregation token parameters:

```
mgx8830a.1.PXM.a > dsppnni-intf [node-index] [port-id]
```

The following example shows the report for this command:

```
mgx8830a.1.PXM.a >  dsppnni-intf 11:2.2:22
Physical port id: 11: 2.2:22       Logical port id:   17504278
   Aggr token..........         0     AW-NRTVBR...........      5040
   AW-CBR..............      5040     AW-ABR..............      5040
   AW-RTVBR............      5040     AW-UBR..............      5040
mgx8830a.1.PXM.a >
```

Table 8-17 describes the objects displayed for the **dsppnni-intf** command.

Table 8-17 Objects Displayed for the dsppnni-intf Command

Parameter	Description
portid	The Port Identifier.
token	The 32-bit number used for link aggregation purpose.
aw	The 24-bit number used as administrative weight on this interface. The maximum possible value is a 24-bit unsigned integer.

Displaying the PNNI Link Table

Enter the **dsppnni-link** command to show the PNNI link table.

```
mgx8830a.1.PXM.a > dsppnni-link [node-index] [port-id]
```

If you specify:

- Both <*node-index*> and <*port-id*>, the command displays information about that specific <*port-id*> port.
- Only <*node-index*>, the command displays information about all PNNI link attached to the <*node-index*> node.
- Without any options, the command displays all links attached to all PNNI nodes on this switching system.

The final option allows you to see all communication lines in the PNNI network.

The following example shows the report for this command:

```
mgx8830a.1.PXM.a >  dsppnni-link

node index   : 1
Local port id:   17504278          Remote port id:   17176597
Local Phy Port Id: 11:2.2:22
   Type. lowestLevelHorizontalLink     Hello state....... twoWayInside
   Derive agg...........         0     Intf index...........  17504278
   SVC RCC index........         0     Hello pkt RX.........     17937
                                       Hello pkt TX.........     16284
   Remote node name.......Paris
   Remote node id.........56:160:47.00918100000000107b65f27c.00107b65f27c.01
   Upnode id.............0:0:00.000000000000000000000000.000000000000.00
   Upnode ATM addr........00.000000000000000000000000.000000000000.00
   Common peer group id...00:00.00.0000.0000.0000.0000.0000.00

node index   : 1
Local port id:   17504288          Remote port id:   17045536
Local Phy Port Id: 11:2.1:32
   Type. lowestLevelHorizontalLink     Hello state....... twoWayInside
   Derive agg...........         0     Intf index...........  17504288
   SVC RCC index........         0     Hello pkt RX.........     18145

Type <CR> to continue, Q<CR> to stop:
```

```
                                            Hello pkt TX.........     19582
   Remote node name.......SanJose
   Remote node id.........56:160:47.00918100000000309409f1f1.00309409f1f1.01
   Upnode id..............0:0:00.000000000000000000000000.000000000000.00
   Upnode ATM addr........00.000000000000000000000000.000000000000.00
   Common peer group id...00:00.00.0000.0000.0000.0000.0000.00

node index   : 1
Local port id:   17504289          Remote port id:   17045537
Local Phy Port Id: 11:2.1:33
   Type. lowestLevelHorizontalLink     Hello state....... twoWayInside
   Derive agg...........         0     Intf index...........  17504289
   SVC RCC index........         0     Hello pkt RX.........     17501
                                       Hello pkt TX.........     18877
   Remote node name.......SanJose
   Remote node id.........56:160:47.00918100000000309409f1f1.00309409f1f1.01
   Upnode id..............0:0:00.000000000000000000000000.000000000000.00
   Upnode ATM addr........00.000000000000000000000000.000000000000.00
   Common peer group id...00:00.00.0000.0000.0000.0000.0000.00
```

Displaying the PNNI Routing Policy

Enter the **dsppnni-routing-policy** command to display the routing policies used for background routing tables generation.

```
mgx8830a.1.PXM.a > dsppnni-routing-policy
```

The following example shows the report for this command:

```
mgx8830a.1.PXM.a >  dsppnni-routing-policy
   SPT epsilon.........         0     Load balance........    random
   SPT holddown time...         1     On demand routing...  best fit
   SPT path holddown time       2     AW Background Table         on
   CTD Background Table        on     CDV Background Table        on
mgx8830a.1.PXM.a >
```

Table 8-18 describes the objects displayed for the **dsppnni-routing-policy** command.

Table 8-18 Objects Displayed for the dsppnni-routing-policy Command

Parameter	Description
SPT epsilon	The tolerance used during route calculation to determine which paths qualify as equal-cost. The range is from 0 – 20.
SPT holddown	The interval between two consecutive calculations for generating routing tables. The range is from 1 (0.1 sec) to 600 (60 sec).
SPT path holddown time	The minimum time that can elapse between consecutive calculations that generate routing tables for border nodes. The range is from 2 (0.2 sec) to 600 (60 sec).
CTD Background Table	Displays whether CDT[1] for the background routing table is enabled or disabled. CTD is the time interval between a cell exiting source node and entering the destination node.

Table 8-18 Objects Displayed for the dsppnni-routing-policy Command (continued)

Parameter	Description
Load balance	Defines the load balancing rule if alternative equal-cost routes exist for a given call request.
Ondemand Routing	The on-demand routing rule, which is either *firstfit* or *bestfit*. *Firstfit* routing selects the first route found that goes to the selected destination. Firstfit route search time is minimized, but the selected route is not optimum. *Bestfit* routing selects a route based on the least-cost. The average route- search-time is greater, and more CPU-intensive, but the optimum route is selected.
AW Background Table	Displays whether the maximum cost (total AW) for the background routing table is enabled or disabled.
CDV Background Table	Displays whether CDV[22] for the background routing table is enabled or disabled. CDV is a component of cell transfer delay, and is a quality of service (QoS) delay parameter associated with CBR and VBR service. Cell Delay Variation is the variation of delay between cells, measured peak to peak.

1. CTD = cell transfer delay
2. CDV = cell delay variation

Displaying the SVCC RCC Timer

Enter the **dsppnni-svcc-rcc-timer** command to display SVCC-based RCC variables.

```
mgx8830a.1.PXM.a > dsppnni-svcc-rcc-timer
```

The following example shows the report for this command:

```
mgx8830a.1.PXM.a > dsppnni-svcc-rcc-timer
node index: 1
   Init time...........         4     Retry time..........        30
   Calling party integrity time...        35
   Called party integrity time....        50
```

Table 8-19 shows the objects displayed for the **dsppnni-svcc-rcc-timer** command.

Table 8-19 Objects Displayed for the dsppnni-svcc-rcc-timer Command

Parameter	Description
node-index	The node index assigned to a PNNI logical node on a network. The range is from 1 to 65535.
Init time	The amount of time (in seconds) this node will delay advertising its choice of preferred an SVCC to a neighbor with a numerically lower ATM address, after determining that such an SVCC should be established. The range is from 1 to 10.

Table 8-19 Objects Displayed for the dsppnni-svcc-rcc-timer Command (continued)

Parameter	Description
Retry time	The amount of time (in seconds) this node will delay after an apparently still necessary and viable SVCC-based RCC is unexpectedly torn down, before attempting to re-establish it. The range is from 10 to 60.
Calling party integrity time	When the node initiates an SVCC as a calling party, this parameter establishes the amount of time this node will wait for an SVCC to become fully established. If the SVCC is not fully established at the end of the configured time, it is torn down. The range is 5 to 300 seconds.
Called party integrity time	When the node receives an SVCC setup as the called party, this parameter establishes the amount of time this node will wait for the SVCC to become fully established. If the SVCC is not fully established at the end of the configured time, it is torn down. The range is 10 to 300 seconds.

Displaying Routing Policy Parameters

Enter the **dsppnni-timer** command to display the routing policy parameters.

```
mgx8830a.1.PXM.a > dsppnni-timer
```

The following example shows the report for this command:

```
mgx8830a.1.PXM.a >  dsppnni-timer
node index: 1
   Hello holddown(100ms)...        10     PTSE holddown(100ms)...        10
   Hello int(sec)..........        15     PTSE refresh int(sec)..      1800
   Hello inactivity factor.         5     PTSE lifetime factor...       200
   Retransmit int(sec).....         5
   AvCR proportional PM....        50     CDV PM multiplier......        25
   AvCR minimum threshold..         3     CTD PM multiplier......        50
   Peer delayed ack int(100ms)...................       10
   Logical horizontal link inactivity time(sec)..      120
```

Displaying the SVCC RCC Table

Enter the **dsppnni-svcc-rcc** command to display the PNNI SVCC RCC Table.

```
mgx8830a.1.PXM.a > dsppnni-svcc-rcc [node-index] [svc-index]
```

If you specify both the node-index and the svc-index, the command displays information about an SVCC-based RCC. If you specify only node-index, the command displays all SVC-based RCCs attached to the svc-index node. If you specify no options, the command displays all SVC-based RCCs attached to all PNNI nodes on this WAN as shown in the following example.

```
Geneva.7.PXM.a > dsppnni-svcc-rcc
node index: 1 svc index: 33
Hello pkt RX........ 34 SVCC VPI........... 34
Hello pkt TX........ 34 SVCC VCI........... 128
Hello state.......... 2wayOutside
Remote node id.........56:160:39.840f80113744000000400202.00107b0efe01.00
Remote node ATM addr...39:840f.8011.3744.0000.0040.0102.4000.0c80.8030.00
node index: 2 svc index: 33
Hello pkt RX........ 34 SVCC VPI........... 34
Hello pkt TX........ 34 SVCC VCI........... 128
Hello state...........2wayOutside
Remote node id.........56:160:39.840f80113744000000400202.00107b0efe01.00
Remote node ATM addr...39:840f.8011.3744.0000.0040.0102.4000.0c80.8030.00
```

Managing CUGs

CUG configuration is a two-step process.

1. Define the address or prefix of an interface through the **addaddr** command as described in the "Assigning Address Prefixes and AESAs" section later in this chapter.
2. Add a CUG to the interface address or prefix through the **addcug** command.

The following sections describe processes and procedures that relate to CUG configuration and management.

Assigning Address Prefixes and AESAs

CUGs can be associated with AESAs or address prefixes. When PNNI is establishing a route between two CUG members, PNNI searches routing tables for the best route to the destination address. When the best route is located, the call proceeds to the destination switch, which selects the appropriate interface by searching internal address tables for the longest prefix match. When a switch and its interfaces are configured with prefixes that enable PNNI to quickly locate the destination interface, PNNI routing and CUG validation are most efficient. For more information about address prefix and AESA assignment, refer to the *Cisco PNNI Network Planning Guide for MGX and SES Products*.

Before you can assign a CUG to an address prefix or AESA, that prefix or AESA must be added to an interface. The address assignment makes the prefix or AESA known to PNNI, and makes it available for assignment to a CUG.

Use the following procedure to add an address or prefix to an interface.

Step 1 Establish a configuration session using a user name with GROUP1 privileges or higher.

Step 2 Enter the **dsppnports** command to locate the port to which you want to add the address,.

Step 3 Specify an ATM address for the port using the **addaddr** command as follows:

addaddr <*portid*> <*atm-address*> <*length*> [**-type int**] [**-proto local**] [**-plan** {**e164** | **nsap**}] [**-scope** *scope*] [**-redistribute** {**yes** | **no**}] [**-tnid** *tnid*]

Table 3-14 in Chapter 3, "Provisioning PXM1E Communication Links." describes the **addaddr** command parameters.

The following example assigns an ATM address to port 9:1.2:2:

```
mgx8830a.1.PXM1.a > addaddr 1:2.1:3 47.1111.1111.1111.1111.1111.1111.1111.1111.1111.11 160
```

Step 4 To verify that the new address has been assigned, enter the **dspatmaddr** <*portid*> command. Replace <*portid*> with the appropriate port identifier in the format *slot*:*bay.line*:*ifnum*.

In the following example, the user displays the ATM address for port 2:2.2:1:

```
mgx8830a.1.PXM1.a > dspatmaddr 2:2.2:1

Port Id: 2:2.2:1
Configured Port Address(es) :
 47.1111.1111.1111.1111.1111.1111.1111.1111.1111.11
length: 160    type: internal      proto: local
scope: 0       plan: nsap_icd      redistribute: false
```

For more information about address assignment and address assignment issues that apply to CUGs, refer to the "*Cisco PNNI Network Planning Guide for MGX and SES Products*."

Creating Closed User Groups

A CUG is established by assigning the same 24-byte *interlock code* to two or more prefixes or AESAs on a PNNI network. All prefixes and addresses that share the same interlock code are considered part of the same CUG and can establish connections amongst themselves, unless these connections are blocked by configuration options.

The interlock code is defined within the PNNI node and is not shared with CPE. If a CPE AESA is a member of only one CUG and that CUG is defined as the *preferential* CUG (see "Managing Access Between a CUG Member and Non-Members or Members of other CUGS," which appears later in this chapter), the CPE does not need to be configured to use a particular CUG. The preferential CUG serves as the *implicit* CUG, and is used whenever a CUG is not specified by the CPE.

A CPE must be configured to specify a particular CUG during call setup when any of the following conditions exist:

- One or more CUGs are defined for the CPE prefix or address and no preferential CUG is defined.
- Multiple CUGs are defined for the prefix or address and the CPE intends to use a CUG other than the preferential CUG.

To select a CUG, the CPE is configured with a CUG index, which is a number that you assign when you assign a prefix or address to a CUG with the **addcug** command. When a CPE requests a specific CUG during call setup, this is called an *explicit* CUG request.

If a prefix or address is not assigned to any CUG, it can still communicate with a CUG member only when that member is configured to communicate with non-CUG members. This is described in "Managing Access Between a CUG Member and Non-Members or Members of other CUGS," which appears later in this chapter.

To create a CUG or assign a new user to a CUG, use the following procedure.

Step 1 Establish a configuration session using a user name with SUPER_GP privileges or higher.

Step 2 To create a CUG or to add a prefix or address to an existing CUG, enter the **addcug** command using the following format:

```
mgx8830a.1.PXM1.a > addcug <atm-address> <length> <plan> <cug-index> <aesa-ic>
[-callsbarred {none|incoming|outgoing}]
```

Table 8-20 defines the **addcug** command parameters and options.

Table 8-20 addcug/dspcug Command Parameters and Options

Parameter or Option	Description
atm-address	Replace this parameter with the NSAP or E.164 address or prefix of a local UNI interface.
length	If the prefix or address you are assigning to a CUG uses the NSAP format, specify the address length in bits. A full AESA is 160 bits (20 bytes times 8 bits). A shorter address length indicates an ATM address prefix, which assigns all addresses with that prefix to the CUG you specify. If the prefix or address you are assigning to a CUG uses the E.164 format, specify the prefix or address length in digits.
plan	If the prefix or address you are assigning to a CUG uses the NSAP format, specify **nsap**. If the prefix or address you are assigning to a CUG uses the E.164 format, specify **e164**.
cug-index	Enter a unique CUG Index number for this prefix or address. The range is 1 to 65535.
aesa-ic	Replace this parameter with the 24-byte interlock code. You can use any 24-byte number you want. The CUG specifications provide some recommendations for this number. One option is to use the ATM address of a network node for the first 20 bytes and provide a unique 4-byte suffix. For example, if a particular customer's home network enters the ATM network at node xyz, you might use the ATM address for node xyz as the prefix in the interlock code.
-callsbarred	This option allows you to restrict access within the CUG. By default, each CUG member can communicate with all other CUG members. To block calls from this member to other CUG members, specify the **-callsbarred outgoing** option. To block calls from other CUG members to this CUG member, specify the **-callsbarred incoming** option. **Note** You can use the **cnfcug** command to change CUG communications after the CUG is assigned to a prefix or address.

Step 3 To verify a new CUG assignment, enter the **dspcug** command as described in the "Displaying CUG Configuration Data" section that follows.

Note After a CUG is assigned to an interface address or prefix, the rules change for adding or deleting that address or prefix on other interfaces.

Displaying CUG Configuration Data

The following procedure describes how to display CUG configuration information.

Step 1 To display any addresses assigned to an interface, enter the **dspaddr** <*portid*> command. Replace <*portid*> with the appropriate port identifier in the format *slot*:*bay.line*:*ifnum*, as shown in the following example:

```
mgx8830a.1.PXM1.a > dspaddr 3:1.7:7
47.1111.1111.1111.1111.1111.1111.1111.1111.1111.11
length: 160    type: internal      proto: local
scope: 0       plan: nsap_icd      redistribute: false
transit network id:
```

> **Note** The **dspaddr** command provides all the information you need to display CUG information for a given address.

Step 2 Enter the **dspcug** command using the following format:

```
mgx8830a.1.PXM1.a > dspcug <atm-address> <length> <plan> <cug-index>
```

The **dspcug** command parameters are described in Table 8-20. You must enter the CUG parameters that were defined when the CUG was assigned with the **addcug** command. These parameters are shown in the display for the **dspaddr** command.

Setting a Default Address for CUG Validation

When the CPE is connected to an interface that does not signal an ATM address, and you want the CPE to participate in a CUG, you must assign an address to the interface that can be used for CUG validation. One way to do this is to assign a default address that will be used for all CUG validation when the CPE does not signal an ATM address. You can then add a CUG to that default CUG address and make that CUG the preferential CUG.

The following procedure describes how to assign a default CUG address to an interface.

Step 1 Establish a configuration session using a user name with GROUP1 privileges or higher.

Step 2 Enter the **setcugdefaddr** command as follows to define a default CUG address:

```
mgx8830a.1.PXM1.a > setcugdefaddr <atm-address> <length> <plan>
```

Table 8-21 defines the **setcugdefaddr** command parameters.

Table 8-21 setcugdefaddr Command Parameters

Parameter or Option	Description
atm-address	Replace this parameter with the NSAP or E.164 address or prefix of a local UNI interface.
length	If the AESA or prefix you are assigning to a CUG uses the NSAP format, specify the address length in bits. A full AESA is 160 bits (20 bytes times 8 bits). A shorter address length indicates an ATM address prefix, which assigns all addresses with that prefix to the CUG you specify. If the prefix or AESA you are assigning to a CUG uses the E.164 format, specify the prefix or address length in digits.
plan	If the prefix or AESA you are assigning to a CUG uses the NSAP format, specify **nsap**. If the prefix or AESA you are assigning to a CUG uses the E.164 format, specify **e164**.

Step 3 Enter the **dspcugdefaddr** <*portid*> command to verify a new default CUG address assignment. Replace <*portid*> with the appropriate port identifier in the format *slot*:*bay.line*:*ifnum*, as shown in the following example.

```
mgx8830a.1.PXM1.a > dspcugdefaddr 6:1.1:11
```

Deleting a Default CUG Address

Enter the **clrcugdefaddr** <*portid*> command to delete a default CUG address assignment. Replace <*portid*> with the appropriate port identifier in the format *slot*:*bay.line*:*ifnum*, as shown in the following example:

```
mgx8830a.1.PXM1.a > clrcugdefaddr 6:1.1:11
```

Managing Access Between Users in the Same CUG

When a user is assigned to a CUG, the default configuration allows the user to initiate outgoing connections to other CUG members and to receive incoming connections from other CUG members. Use the following procedure to disable incoming or outgoing connections to other group members for a specific CUG, or to remove restrictions and enable communications with other CUG members.

Step 1 Establish a configuration session using a user name with SUPER_GP privileges or higher.

Step 2 Enter the **dspcug** command as follows to display the current CUG access configuration for a prefix or address:

```
mgx8830a.1.PXM1.a > dspcug <atm-address> <length> <plan> <cug-index>
```

Note The **dspcug** command is described in the “Displaying CUG Configuration Data” section, which appears earlier in this document.

Step 3 To change a CUG access configuration, enter the **cnfcug** command using the following format:

```
mgx8830a.1.PXM1.a > cnfcug <atm-address> <length> <plan> <cug-index> [-callsbarred
{none|incoming|outgoing}]
```

The **cnfcug** command parameters are described in Table 8-20. You must enter the CUG parameters that were defined when the CUG was assigned with the **addcug** command. The -callsbarred option allows you to change the CUG access configuration for a CUG member.

Note If a CUG membership configuration is modified in any manner, the CUG interlock code information maintained by the routed SVC connections is not altered.

Note You cannot use the **cnfcug** command to change the interlock code for a CUG. The only way to change the interlock code for a CUG is to delete the CUG (**delcug**) and add the CUG (**addcug**) with a new interlock code. When you delete a CUG, all active connections that have been validated with that CUG are unaffected by the change.

Managing Access Between a CUG Member and Non-Members or Members of other CUGS

When a user is assigned to a CUG, the default configuration disables communications with users that are not assigned to the same CUG. Use the following procedure to enable or disable communications between a user and users outside of a CUG.

Step 1 Establish a configuration session using a user name with SUPER_GP privileges or higher.

Step 2 Enter the **dspcug** command to display the current CUG access configuration for a prefix or address, as described in the "Displaying CUG Configuration Data" section earlier in this document.

Step 3 Enter the **dspaddrcug** command as follows to display the current user configuration for non-CUG communications:

```
mgx8830a.1.PXM1.a > dspaddrcug <atm-address> <length> <plan>
```

The **dspaddrcug** command parameters are described in Table 8-20. You must enter the CUG parameters that were defined when the CUG was assigned with the **addcug** command.

The following example shows the information that the **dspaddrcug** command displays:

```
mgx8830a.1.PXM1.a > dspaddrcug 47.0091.8100.0000.0001.4444.7777 104 nsap
Address:           47.0091.8100.0000.0001.4444.7777
Length:            104
Plan:              nsap
Pref cug index:    0
Incoming Access: allowed
Outgoing Access: disallowed
Number of CUGs:  4
CUG indices:     12   50   100   101
```

In the above example, the Incoming Access row shows that this user can accept incoming connections from users outside its CUG membership. The Outgoing Access row shows that this user cannot originate calls to users outside of its CUG membership.

Step 4 To change the configuration for access outside of CUG membership, enter the **cnfaddrcug** command using the following format:

```
mgx8830a.1.PXM1.a > cnfaddrcug <atm-address> <length> <plan> [-pref <cug-index>] [-oa
{disallowed|percall|permanent}] [-ia {disallowed|allowed}]
```

The **cnfaddrcug** command parameters are described in Table 8-22.

Table 8-22 cnfaddrcug Command Parameters

Parameter	Description
atm-address	Replace this parameter with the NSAP or E.164 address or prefix of a local UNI interface.
length	If the prefix or address you are assigning to a CUG uses the NSAP format, specify the address length in bits. A full AESA is 160 bits (20 bytes times 8 bits). A shorter address length indicates an ATM address prefix, which assigns all addresses with that prefix to the CUG you specify. If the prefix or address you are assigning to a CUG uses the E.164 format, specify the prefix or address length in digits.
plan	If the prefix or address you are assigning to a CUG uses the NSAP format, specify **nsap**. If the prefix or address you are assigning to a CUG uses the E.164 format, specify **e164**.
cug-index	Enter a unique CUG Index number for this prefix or address. The range is 1 to 65535.
-oa	The **-oa** (outgoing access) option allows you to change the outgoing access configuration to disallow outgoing calls, enable outgoing calls when an outgoing call specifically requests outside access, or permanently enable outgoing connections as if they were CUG membership connections. For outgoing access, type one of the following words as needed: • disallowed • percall • permanent Default: disallowed
-ia	The **-ia** (incoming access) option allows you to change the incoming access configuration to allow or disallow incoming calls from outside the CUG membership. For incoming access, type one of the following words as needed: • disallowed • allowed Default: disallowed

Step 5 Enter the **dspaddrcug** command to verify the changes made with the **cnfaddrcug** command.

Note The **dspaddrcug** command parameters are described in Table 8-20.

You can use the **cnfaddrcug** command to assign a preferential CUG to a user. A preferential CUG is applied to calls when the user does not specify a CUG index. A user with a preferential CUG does not need to signal a CUG index to establish connections to other members of the preferential CUG.

A preferential CUG assignment is ignored when the user explicitly requests a CUG during call setup.

If a preferential CUG is not assigned to a user and the user originates a call without a CUG index, the call is treated as a normal call that is not part of any CUG. Normal calls cannot be established with CUG members unless those members have been configured to communicate outside the CUG.

The following procedure describes how to assign a preferential CUG to a user.

Note If outgoing calls to the CUG are barred for the user, the CUG cannot be defined as the preferential CUG.

Step 1 Establish a configuration session using a user name with SUPER_GP privileges or higher.

Step 2 Enter the **dspaddrcug** as follows to display the preferential CUG for a user:

```
mgx8830a.1.PXM1.a > dspaddrcug <atm-address> <length> <plan>
```

The **dspaddrcug** command parameters are described in Table 8-20. You must enter the CUG parameters that were defined when the CUG was assigned with the **addcug** command.

The following example shows the information that this command displays:

```
M8950_SF.7.PXM.a > dspaddrcug 47.0091.8100.0000.0001.4444.7777 104 nsap
Address:           47.0091.8100.0000.0001.4444.7777
Length:            104
Plan:              nsap
Pref cug index:    0
Incoming Access: allowed
Outgoing Access: disallowed
Number of CUGs:  4
CUG indices:     12   50   100   101
```

The *Pref cug index* row in the example shows that no CUG has been defined as the preferential CUG.

Step 3 Enter the **cnfaddrcug** command as follows to specify the CUG index of the preferential CUG:

```
mgx8830a.1.PXM1.a > cnfaddrcug <atm-address> <length> <plan> -pref <cug-index>]
```

The **cnfaddrcug** command parameters are described in Table 8-20.

Note The **-pref** option specifies the CUG index of the preferential CUG.

Step 4 Enter the **dspaddrcug** command to verify the changes made with the **cnfaddrcug** command.

Note The **dspaddrcug** command parameters are described in Table 8-20.

Deleting a CUG Assignment

A CUG assignment is made when the **addcug** command is used to assign a user to a CUG. To delete a single CUG assignment, use the following procedure.

Note When you delete a CUG assignment, all active connections that have been validated with that CUG are unaffected by the change. To completely delete a CUG from a network, you must delete all CUG assignments on all switches.

Step 1 Establish a configuration session using a user name with SUPER_GP privileges or higher.

Step 2 To display the current CUG access configuration for a user, enter the **dspcug** command as described in the “Displaying CUG Configuration Data” section, which appears earlier in this document.

Step 3 Enter the **delcug** command as follows to delete the CUG assignment:

```
mgx8830a.1.PXM1.a > delcug <atm-address> <length> <plan> <cug-index>
```

The **delcug** command parameters are described in Table 8-20. You must enter the CUG parameters that were defined when the CUG was assigned with the **addcug** command.

Blocking the CUG IE

When a CUG call is set up, the CPE may generate a CUG information element (IE) during the call setup. If the CPE generates the IE, it contains the CUG index assigned when the CUG was added. When the call setup proceeds to the source switch, the switch can block or forward the CUG information element. The default configuration blocks IE forwarding on UNI interfaces and forwards the CUG on NNI interfaces. This is the *auto* configuration selection.

When the CUG IE is signaled between switches, it contains the CUG interlock code. If CUG IE forwarding is enabled at the destination switch, the interlock code is translated back to a CUG index and forwarded to the CPE by default.

If any switch along the call route cannot accept the CUG IE, or if the destination CPE cannot accept the CUG IE, you can block forwarding of the CUG IE on the appropriate interface. From the point at which the CUG IE is blocked to the destination CPE, the call behaves like a normal call. This feature can be used to allow devices that do not support CUG to participate in CUGs. In this sort of topology, the outgoing interface where the CUG IE is blocked serves as the CUG destination.

Use the following procedure to block forwarding of the CUG IE.

Step 1 Establish a configuration session using a user name with GROUP1 privileges or higher.

Step 2 Enter the **dsppnportie** <*portid*> command as follows to display the current configuration for the CUG IE feature. Replace <*portid*> with the appropriate port identifier in the format *slot*:*bay.line*:*ifnum*.

```
mgx8830a.1.PXM1.a > dsppnportie 3:1.2:2

IE Options for port : 3:1.2:2

PS IE Option    : auto
CUG IE Option   : auto
```

Step 3 Enter the **cnfpnportie** command as follows to block the CUG IE.

```
mgx8830a.1.PXM1.a > cnfpnportie <portid> -cugie disallowed
```

Replace <*portid*> with the port identifier in the format *slot:bay.port:interface*. The *disallowed* option always blocks the CUG IE.

Step 4 To verify your change, enter the **dsppnportie** command as described in Step 2 of this procedure.

Note Refer to Q.2955.1 for more information about when calls are rejected for different IA/OC combinations.

If you want to re-enable CUG IE forwarding on an interface, enter the **cnfpnportie** <*portid*> **-cugie allowed** command. Replace <*portid*> with the port identifier in the format *slot:bay.port:interface*.

Enter the **cnfpnportie** <*portid*> **-cugie auto** command to block the CUG IE on UNI interfaces, and forward it on NNI and AINI interfaces. Replace <*portid*> with the port identifier in the format *slot:bay.port:interface*.

Maintaining a Persistent Network Topology for CWM

If you are using CWM to configure and monitor your network, you can set up and maintain a persistent topology of the routing nodes, feeder nodes, and PNNI links in your network. The persistent topology is maintained in topology databases on each node in a specified peer group. CWM receives network topology information through gateway nodes that are set up by the network administrator. You can setup a gateway node through the CLI or through CWM. This document describes the CLI procedures for configuring gateway nodes and maintaining topology databases on each node in your network. To configure a gateway node through CWM, refer to the current CWM documentation.

Non-gateway nodes maintain a persistent topology of the network in the same way as a gateway node. However, CWM only interacts with gateway nodes. Whenever a node is added, deleted, or a modified in a peer group, that peer group's gateway node sends a trap to CWM so that CWM can update its topology databases.

Once you have set up a gateway node for a peer group, a persistent topology comprised of node, link, and feeder database is automatically created, and you can use CWM to monitor your entire network.

Note All node and connection information is passed only through PNNI links.

Configuring a Gateway Node

Use the following procedure to enable a switch as a gateway node for its peer group.

Step 1 Establish a configuration session on the switch you want to become the gateway node, using a user name with SUPER_GP privileges or higher.

Step 2 On the active PXM card, enter the **cnftopogw on** command to enable the switch as the gateway node for its peer group, as shown in the following example.

```
8830_CH.1.PXM.a > cnftopogw on
```

Step 3 Enter the **dsptopogw** command to verify that the current node is functioning as a gateway, as shown in the following example.

```
8830_CH.1.PXM.a > dsptopogw
Admin State :    ENABLED Operational State    ENABLED
```

The following two states are associated with the topology database:

- the admin state is set by CLI or CWM, and can be either enabled or disabled.
- the operational state can be ENABLED, ENABLING, DISABLED, DISABLING, or FULL.

By default, the node's admin and operational states are DISABLED.

Table 8-23 describes the valid operational and admin state combinations, and how they affect CWM access.

Table 8-23 Valid Operational and Admin State Combinations

Admin State	Oper State	Description	CWM Access
Enabled	Enabled	The node is functioning as a gateway node. You can perform configuration on the node's topology database at any time.	All
Enabled	Enabling	The node has been enabled as a gateway node. During this period, do not perform any configuration on the topology database. Once the database's enabling process is finished, the operational state becomes ENABLED, and the topology can be configured.	No
Disabled	Disabling	The gateway node is going through the disabling process. During this period, do not perform any configuration on the topology database. Once the database's disabling process is finished, the operational state becomes DISABLED, and the node can be enabled.	No
Disabled	Disabled	The node is a non-gateway node. You can perform configuration on the node's topology database at any time.	No
Enabled	Full	The node is functioning as a gateway. However, the node's topology database is full, and can not accept new entries. All operations are still permitted on the topology database.	Yes
Disabled	Full	The node is functioning as a non-gateway node. However, the node's topology database is full, and can not accept new entries. All operations are still permitted on the topology database.	Yes

The gateway node contains information only for the nodes which are up and reachable when you add the gateway node into a peer group. It is not necessary to create a gateway node before creating a peer group, because the database contains all the reachable nodes that were in the peer group when it was first added. However, if a node is down or unreachable when you add a gateway node to a peer group, the information for the downed node will not be present in the topology database of this gateway node.

Note The topology database in Release 3 and later supports only those feeder nodes that are connected to MGX 8850 nodes. Feeder nodes that are connected to other types of nodes do not appear in the persistent topology database.

Both gateway and non-gateway nodes maintain a persistent topology that is comprised of three databases:

- network topology database
- link topology database
- feeder topology database

Upon boot-up, each node populates the topology databases with the information about the other nodes in its peer group. From that point onwards, the topology databases are updated whenever a new neighbor node is added to the peer group.

Displaying the Network Topology Database

On Cisco MGX switches, the network topology database is maintained on both the active and standby PXM cards. Any change in the topology database on the active card is reflected on the standby card to ensure that both cards contain identical databases. Therefore, switch overs do not affect persistent topology operation.

Note PNNI links within the peer group are the only links that appear in the network topology database. Other type of links, such as AINI, links or IISP links, are not included in the network topology database. The topology database does not store information about nodes outside the peer group.

Enter the **dsptopondlist** command to display the entire persistent network topology database, as shown in the following example.

```
M8830_CH.1.PXM.a > dsptopondlist

Number of Entries = 9

Table Index: 1  Node Name: M8830_CH
Node ID: 56:160:47.00918100000000001a538943.00001a538943.01
Primary IP: 10.10.10.133
Primary IP Type: atm0
Secondary IP: 172.29.52.133
Secondary IP Type: lnPci0
SysObjId: 1.3.6.1.4.1.9.1.458
Gateway Mode ENABLED
PTSE in DB: YES

Type <CR> to continue, Q<CR> to stop:
```

```
Table Index: 2  Node Name: PXM1E_SJ
Node ID: 56:160:47.00918100000000001a533377.00001a533377.01
Primary IP: 10.10.10.122
Primary IP Type: atm0
Secondary IP: 172.29.52.122
Secondary IP Type: lnPci0
SysObjId: 1.3.6.1.4.1.9.1.435
Gateway Mode ENABLED
PTSE in DB: YES
```

Enter the **dsptopondlist** command with the <*tableIndex*> option to display information for a specific node in the topology database, as shown in the following example. Replace <*tableIndex*> with the appropriate node's topology index number.

```
M8830_CH.1.PXM.a > dsptopondlist 1

Number of Entries = 9

Table Index: 1  Node Name: M8830_CH
Node ID: 56:160:47.00918100000000001a538943.00001a538943.01
Primary IP: 10.10.10.133
Primary IP Type: atm0
Secondary IP: 172.29.52.133
Secondary IP Type: lnPci0
SysObjId: 1.3.6.1.4.1.9.1.458
Gateway Mode ENABLED
PTSE in DB: YES
```

Note In a mixed network of pre-3.0 and 3.0 nodes, the Primary IP, Secondary IP, Gateway Mode flag, and sysObjId values of the pre-3.0 nodes are not included in the topology database. For pre-3.0 nodes, the topology database contains only the node ID and the node name values.

Note In a mixed network of Release 4 nodes and pre-Release 4 nodes, outside links between nodes running a software version earlier than Release 4 are not supported in the topology database.

The network topology database contains information for gateway nodes and feeder nodes in a peer group. Table 8-24 describes the feeder node information included in the topology database.

Table 8-24 Topology Database Feeder Node Information

Object	Description
Local PNNI Node ID	Local switch
Local IF Index	Number that identifies the local port the feeder is connected to on the switch.
Local IF Name	Name of the local interface.
Feeder node name	Name of the node.
Feeder node ATM IP address	ATM IP address of the feeder node.
Feeder node LAN IP address	LAN IP address for the feeder node.

Table 8-24 Topology Database Feeder Node Information (continued)

Object	Description
Feeder Shelf	The feeder's shelf numbers, which identify the port on the feeder itself.
Feeder Slot	The feeder's slot number, which identify the port on the feeder itself.
Feeder Port	The feeder's port numbers, which identify the port on the feeder itself.
Feeder model number	The feeder's model number. This integer is used to differentiate between feeder platforms.
Feeder LMI type (whether the port is feeder or XLMI)	Displays whether the Link Management Interface (LMI) is a regular feeder or XLMI.
Feeder type	Identifies the feeder type.

Note Only 16 feeder entries can be stored in the topology database for each routing node. If more than 16 feeders are provisioned on one switch, there might be inconsistencies between the actual feeders and the feeder information in the topology database.

Enter the **dsptopogwndlist** command to display a list of the gateway nodes in the topology database, as shown in the following example:

```
M8830_CH.1.PXM.a > dsptopogwndlist

table index:   1  node name: M8830_CH
node id:56:160:47.00918100000000001a538943.00001a538943.01

table index:   2  node name: PXM1E_SJ
node id:56:160:47.00918100000000001a533377.00001a533377.01

table index:   5  node name: M8850_SF
node id:56:160:47.009181000000000164444b61.000164444b61.01
```

Displaying Link Information

The network topology database contains information about the links in the peer group. When a node is configured as gateway node, that node's current PNNI link information is saved in the link topology database. If a link is down when the node is configured as a gateway node, the downed link will not appear in the topology database until it comes back up.

Enter the **dsptopolinklst** command to display link information for all links in the topology database, as shown in the following example.

```
M8830_CH.1.PXM.a > dsptopolinklist

Number of Link Entries in Persistent Topo DataBase = 21

Persistent Topo Link Index: 1
Local Node Id             : 56:160:47.00918100000000001a533377.00001a533377.01
Remote Node Id            : 56:160:47.009181000000000036b5e31b3.00036b5e31b3.01
Local Port Id             : 7:2.9:29
Local PnniPort Id         : 17251101
Remote PnniPort Id        : 17176597
Is Outside Link           : No
Persistent Topo Node Index: 2

Persistent Topo Link Index: 2
Local Node Id             : 56:160:47.00918100000000001a538943.00001a538943.01
Remote Node Id            : 56:160:47.009181000000000036b5e2bb2.00036b5e2bb2.01
Local Port Id             : 1:2.1:1
Local PnniPort Id         : 16845569
Remote PnniPort Id        : 17569793
Is Outside Link           : No
Persistent Topo Node Index: 1

Persistent Topo Link Index: 3

Type <CR> to continue, Q<CR> to stop:
```

Enter the **dsptopolinklist -topoIndex** {*topoIndex*} command to display all link information for a specific node in the topology database, as shown in the following example. Replace {*topoIndex*} with the node's topology index number.

```
M8830_CH.1.PXM.a > dsptopolinklist -topoIndex 1

Number of Link Entries in Persistent Topo DataBase = 21

Persistent Topo Link Index: 2
Local Node Id             : 56:160:47.00918100000000001a538943.00001a538943.01
Remote Node Id            : 56:160:47.009181000000000036b5e2bb2.00036b5e2bb2.01
Local Port Id             : 1:2.1:1
Local PnniPort Id         : 16845569
Remote PnniPort Id        : 17569793
Is Outside Link           : No
Persistent Topo Node Index: 1
```

Enter the **dsptopolinklist -linkIndex** {*link_index*} command to display information about a specific link in the topology database, as shown in the following example. Replace {*link_index*} with the appropriate topology link index number.

```
M8830_CH.1.PXM.a > dsptopolinklist -linkIndex 1

Number of Link Entries in Persistent Topo DataBase = 21

Persistent Topo Link Index: 1
Local Node Id             : 56:160:47.00918100000000001a533377.00001a533377.01
Remote Node Id            : 56:160:47.009181000000000036b5e31b3.00036b5e31b3.01
Local Port Id             : 7:2.9:29
Local PnniPort Id         : 17251101
Remote PnniPort Id        : 17176597
Is Outside Link           : No
Persistent Topo Node Index: 2
```

Displaying Feeder Information

The feeder database contains information about feeder nodes and nodes attached to XLMI links.

Enter the **dsptopofdrlst** command to display information about all feeder nodes in the topology database, as shown in the following example.

```
M8830_CH.1.PXM.a > dsptopofdrlist

Total # of Feeder Entries in Table = 2

Index  feeder name   type       model #  lmi type  shelf  slot  port
------ ------------  --------   -------  --------  -----  ----  ----
    1   M8250_SJ     fdrPAR      8250    feeder      1      7     1

Node Topo Index: 6
Node Name: M8850_LA
Node ID: 56:160:47.00918100000000036b5e2bb2.00036b5e2bb2.01
Local IfIndex: 17176589
Local IfName: atmVirtual.06.1.3.13
Feeder ATM IP: 10.10.10.111
Feeder LAN IP: 172.29.52.111

Index  feeder name   type       model #  lmi type  shelf  slot  port
------ ------------  --------   -------  --------  -----  ----  ----
    2   8850_R1      fdrPAR      8850    feeder      1      7     1

Node Topo Index: 7
Node Name: M8850_NY
Node ID: 56:160:47.00918100000000036b5e31b3.00036b5e31b3.01

Type <CR> to continue, Q<CR> to stop:
```

Enter the **dsptopofdrlist -topoindex** <*topoIndex*> command to display information about all feeder nodes attached to a specific node in the topology database, as shown in the following example. Replace <*topoIndex*> with the appropriate node's topology index number.

```
M8830_CH.1.PXM.a > dsptopofdrlist <topoIndex
```

Enter the **dsptopofdrlist -fdrIndex** <*fdrIndex*> to display information about a specific feeder in the topology database, as shown in the following example. Replace <*fdrIndex*> with the appropriate feeder's topology index number.

```
M8830_CH.1.PXM.a > dsptopofdrlist -fdrIndex 1

Total # of Feeder Entries in Table = 2

Index  feeder name   type       model #  lmi type  shelf  slot  port
------ ------------  --------   -------  --------  -----  ----  ----
    1   M8250_SJ     fdrPAR      8250    feeder      1      7     1

Node Topo Index: 6
Node Name: M8850_LA
Node ID: 56:160:47.00918100000000036b5e2bb2.00036b5e2bb2.01
Local IfIndex: 17176589
Local IfName: atmVirtual.06.1.3.13
Feeder ATM IP: 10.10.10.111
Feeder LAN IP: 172.29.52.111


M8830_CH.1.PXM.a >
```

Note Cisco recommends that you avoid using PXM1E nodes as gateway nodes due to memory limitation.

Note Cisco recommends that you configure two gateway nodes for each SPG network or lowest level peer groupings of MPG. If one node goes down, CWM can pick the other node and start using it.

Disabling a Gateway Node

To disable a node's status as a gateway node, use the following procedure:

Step 1 Establish a configuration session on the switch you want to become the gateway node, using a user name with SUPER_GP privileges or higher.

Step 2 On the active PXM card, enter the **cnftopogw off** command to disable the node's status as the gateway node for the peer group, as shown in the following example.

```
8830_CH.1.PXM.a > cnftopogw off
```

Step 3 Enter the **dsptopogw** command to verify that the current node is functioning as a gateway, as shown in the following example.

```
8830_CH.1.PXM.a > dsptopogw
Admin State :    DISABLED Operational State    DISABLING
```

The display shows that the gateway node is going through the disabling process. During this period, do not perform any configuration on the topology database. Enter the **dsptopogw** command again until the Operational State shows that the disabling process is DISABLED, as shown in the following example.

```
8830_CH.1.PXM.a > dsptopogw
Admin State :    DISABLED Operational State DISABLED
```

Once a gateway node has been disabled, that node operates as a regular non-gateway node in the peer group. If another node in the peer group is not configured as a gateway node, CWM will not maintain a persistent topology of that peer group.

Deleting a Node from the Topology Database

When a node is removed from the network, it is not automatically removed from the network topology database. Because information about the removed node is stored in the topology databases of every other node in the peer group, you need to delete the removed node from each node's topology database, regardless of whether the node is a gateway or non-gateway node.

Use the following procedure to delete a node from the topology database.

Step 1 Physically remove the node from the network by disconnecting the cables, downing all the links between that node and the network, or powering down that node.

Caution Wait for at least one hour before proceeding to Step 2. This ensures that the information for the deleted node will not be added back into the topo database of the other nodes in the peer group if any of them are rebooted.

Step 2 Establish a configuration session using a user name with SUPER_GP privileges or higher.

Step 3 Enter the **dsptopondlist** command to display all nodes in the topology node list and obtain the topology index number of the node you want to delete.

Step 4 Enter the **deltopond** <*topoIndex*> command to delete the appropriate node from the node topology database. Replace <*topoIndex*> with index number of the node you want to delete, as shown in the following example:

```
M8830_CH.1.PXM.a > deltopond 1
```

Step 5 Enter the **dsptopondlist** command to verify that the appropriate node was deleted from the node topology database.

Note If a node entry is deleted from the database, then the feeder nodes which are attached to this node are also deleted from the database.

Deleting a Link from the Topology Database

To delete a link entry from the topology database, use the following procedure.

Step 1 Establish a configuration session using a user name with SUPER_GP privileges or higher.

Step 2 Enter the **dsptopolinklist** command to display all links in the link database and obtain the topology index number of the link you want to delete.

Step 3 Enter the **deltopolink** <*linkIndex*> command to delete the appropriate link from the link topology database. Replace <*linkIndex*> with the index number of the link you want to delete, as shown in the following example:

```
M8830_CH.1.PXM.a > deltopolink 1
```

Step 4 Enter the **dsptopolinklist** command to verify that the appropriate link has been deleted from the link topology database.

CHAPTER 9

Switch Operating Procedures

This chapter describes procedures you can use to manage the Cisco MGX 8830, Cisco MGX 8850 (PXM1E/PXM45), and Cisco MGX 8950 switches and the Cisco MGX 8880 Media Gateway.

Managing the Configuration Files

The following sections describe how to save a switch configuration in a single zipped file, clear or erase a configuration, and restore a configuration from a file.

Saving a Configuration

After configuring your switch or after making configuration updates, it is wise to save the configuration. It is also good practice to save the configuration before upgrading the software. Restoring a saved configuration is much easier than re-entering all the commands used to configure the switch.

To save a configuration, enter the **saveallcnf** command, which saves the configuration to a file in the C:/CNF directory. To prevent the saved files from consuming excessive disk space, the switch preserves only two configuration files. If you save a third time, the older of the two existing files is replaced by the newer file.

Tip To prevent overwriting of older configuration files, transfer those files to another storage media.

A saved configuration file is named using the switch name and the current date as follows:

switchname_dateCode<N|O>

The date appears in YYMMDD (year, month, day) format. When two configurations are saved on the same day, the letters N or O indicate if the saved file is the newest or oldest configuration file. For example, if the configuration for a switch named *M8950_SF* is saved on January 24th, the file is named C:/CNF/M8950_SF_040124N. An older file that was saved on the same day would be renamed M8950_SF_040124O. If the configuration is saved on different days, both files are saved with the N indicator.

When you save a configuration, the switch saves all configuration data, including the software revision levels used by the cards in the switch. The saved configuration file does not include the boot and runtime software files. Should you need to restore a configuration, the **restoreallcnf** command restores the configuration exactly as it was when the configuration file was saved. If the boot and runtime files have been removed from the switch, they must be transferred to the switch before the restored configuration can start.

Note If you have upgraded software on the switch since the last time the configuration was saved, a configuration restore will restore the non-upgraded software versions and configuration data. The software does not allow you to save a configuration and restore it on a different revision level of the software.

You can save a configuration if both of the following are true:

- No save or restore process is currently running.
- No configuration changes are in progress.

Caution Make sure that no other users are making configuration changes when you save the configuration. The Cisco MGX switches do not check for other CLI or CWM users before saving a configuration. If other users make changes while the file is being saved, the configuration can become corrupt. If you try to restore the configuration from a corrupt file, the switch can fail and you might have to send switch cards back to the factory for reprogramming.

To save a switch configuration, use the following procedure.

Step 1 Establish a configuration session using a user name with SERVICE_GP privileges or higher.

Step 2 To save the configuration, enter the **saveallcnf** command:

```
mgx8830a.7.PXM.a > saveallcnf [-v]
```

The verbose option, **-v**, displays messages that show what the switch is doing during the save process. You do not need to see these messages, but they do give you an indication on how the save process is proceeding. If you do not enter the **-v** option, the switch does not display any status messages until the save is complete.

Note The switch stores only the last two files saved with the **saveallcnf** command. Each time the command is run, the oldest of the two configuration files is replaced. This prevents the hard disk from getting full due to repetitive use of this command. If you need to save files that will be erased the next time the **saveallcnf** command is run, use an FTP client to copy them to a file server or workstation before saving the next configuration.

Step 3 Read the prompt that appears. Press **Y** if you want to continue, and then press **Enter**.

When the save is complete, the switch prompt reappears, and the new file is stored in the C:/CNF directory.

Note After you enter the **saveallcnf** command, it takes several minutes for the switch to save the current configuration.

The following example shows what appears on the switch when the **saveallcnf** command is used without the **-v** option:

```
M8950_SF.7.PXM.a > saveallcnf

The 'saveallcnf' command can be time-consuming. The shelf
must not provision new circuits while this command is running.

Do not run this command unless the shelf configuration is stable
or you risk corrupting the saved configuration file.



ATTENTION PLEASE NOTE:
        -> If you want to abort the save, please use abortallsaves CLI.
        If you use cntrl-C, you will risk hanging the whole telnet
        session and may lose capability of being able to perform
        subsequent saves

        -> The save command will only store the
        2 most recent saved files in C:/CNF directory.
        If you have 2 or more files already saved in C:/CNF,
        the older ones will be deleted by the current save,
        keeping the 2 most recent.

saveallcnf: Do you want to proceed (Yes/No)? y
```

Note Once you have saved a file to the CNF directory, Cisco recommends that you FTP to transfer this file to another storage media. The goal is to ensure that the file is not accidentally deleted from the CNF directory, lost if the PXM hard drive fails, or corrupted if a PXM fails.

Once the switch has finished saving the current configuration, the screen output confirms that the configuration was saved to the CNF directory, and lists the files that were zipped, as shown in the following example.

```
saveallcnf: shelf configuration saved in C:/CNF/M8950_SF_040124N.
These files were zipped:
 Length  Method   Size  Ratio   Date    Time   CRC-32     Name
 ------  ------   ----  -----   ----    ----   ------     ----
   2485  Defl:N    2196  88%  01-24-04  18:12  e8459670   SSHD.zip
     40  Defl:N      42 105%  01-24-04  18:12  60c1bc95   version
14469106  Defl:N 14473298 100%  01-24-04  18:12  d68e426b   RPM.zip
   5968  Defl:N    2484  41%  01-24-04  18:11  dd6daa59   SCTF.zip
  72307  Defl:N   37767  52%  01-24-04  18:11  7db65e6e   SCTC.zip
   6087  Defl:N    4920  80%  01-24-04  18:11  16a9409e   SHMDB.zip
 403713  Defl:N   31181   7%  01-24-04  18:11  9cc9ab0c   LS7.zip
  37752  Defl:N    6560  17%  01-24-04  18:09  e75ace4f   LS12.zip
  46935  Defl:N    7142  15%  01-24-04  18:09  f6666588   LS4.zip
  13972  Defl:N    2877  20%  01-24-04  18:09  bdc79d60   LS15.zip
  19350  Defl:N    4468  23%  01-24-04  18:09  33a97dff   LS14.zip
  19364  Defl:N    3299  17%  01-24-04  18:09  cf5d3420   LS1.zip
  13707  Defl:N    2606  19%  01-24-04  18:09  542d0fce   LS16.zip
  19251  Defl:N    3133  16%  01-24-04  18:09  cf2d2074   LS5.zip
  14379  Defl:N    3310  23%  01-24-04  18:09  37846a6f   LS6.zip
  76847  Defl:N   43790  56%  01-24-04  18:09  86af5ddd   LS11.zip
     82  Defl:N      71  86%  01-24-04  18:12  052b8d88   csrStatus.txt
    521  Defl:N     151  28%  01-24-04  18:12  38722b4b   csrTable.txt
 524160  Defl:N  434853  82%  01-24-04  18:09  4ee160ba   bram.img
```

Step 4 In preparation for viewing the saved configuration file, enter the **cd C:CNF/** command to go to the directory where the file was saved.

```
M8850_NY.7.PXM.a > cd C:CNF/
```

Step 5 To verify the file is there, enter the **ll** command to list the directory contents.

```
M8950_SF.7.PXM.a > ll

Listing Directory .:
drwxrwxrwx  1 0       0            16384 Jan 24 18:12 ./
drwxrwxrwx  1 0       0            16384 Jan 23 04:38 ../
drwxrwxrwx  1 0       0            16384 Jan 24 18:12 TMP/
-rwxrwxrwx  1 0       0         15065924 Jan 24 18:12 M8950_SF_040124N
-rwxrwxrwx  1 0       0         15065919 Jan 24 17:50 M8950_SF_040124O

In the file system :
    total space :  818992 K bytes
    free  space :  692832 K bytes
```

Clearing a Switch Configuration

There are two commands that allow you to clear the switch configuration: **clrcnf** and **clrallcnf**.

To clear switch provisioning data such as the PNNI controller and SPVC connections, enter the **clrcnf** command. This command clears all configuration data except the following:

- IP address configuration
- Node name
- Software version data for each card
- SNMP community string, contact, and location
- Date, time, time zone, and GMT offset
- MPSM feature licenses in the license pool

To clear the entire configuration, use the **clrallcnf** command using the following format:

```
M8850_LA.8.PXM.a > clrallcnf [clrLicense]
```

This command clears all the provisioning data and most of the general switch configuration parameters, such as the switch name and SNMP configuration. The **clrallcnf** command clears all IP addresses except the boot IP address.

If you include the *clrLicense* option, the command clears all MPSM feature licenses. If the *clrLicense* option is not included, the licenses remain on the switch, but they cannot be used unless the switch runs the same software versions that were in use when the configuration was cleared.

Clearing a Slot Configuration

The **clrsmcnf** command allows you to clear the configuration for a single service module. All provisioning is deleted and any MPSM licenses in use are returned to the license pool. If the **-all** parameter is added, card specific information is deleted too. The card specific information for most cards is the software revision number. For MPSM cards, the card specific information includes the service selected (ATM, circuit emulation, or Frame Relay) and the interface type selected.

Note When replacing a T1 or T3 card with a E1 or E3 card, or vice versa, you must enter the **clrsmcnf** command on the appropriate slot before you install the replacement card.

To clear the configuration for a service module, use the following procedure.

Step 1 Establish a configuration session using a user name with SERVICE_GP privileges or higher.

Step 2 If the card is configured for redundancy, remove card redundancy with the **delred** command. For more information, see the "Removing Redundancy Between Two Cards" section later in this chapter.

Note The **clrsmcnf** command does not work on redundant cards.

Step 3 Enter the **clrsmcnf** command as follows:

```
PXM1E_SJ.8.PXM.a > clrsmcnf <slot-id> [all] [verbose]
```

Replace *slot-id* with the slot number of the service module you want to clear. As described in the introduction to this procedure, include the **all** parameter if you want to delete all provisioning and card-specific information. When included, the **verbose** option displays status statements during the clearing of the service module configuration.

After you enter the **clrsmcnf** command, the service module reboots. If you cleared only the provisioning, the card will come up in the Active state using the same software revision that was in use before the configuration was cleared. If you used the all option to clear the entire card configuration, the service module will act as if it were newly installed in a slot that has no configuration assigned to it. When no configuration is assigned to a slot, you can move any card type into the slot and initialize the card as if it were a new card.

Step 4 To display the status of a service module, enter the **dspcd** command.

Restoring a Saved Switch Configuration

You can restore a configuration if all of the following statements are true:

- No save or restore process is currently running.
- No configuration changes are in progress.
- The switch is not hosting any critical calls.
- A switch configuration file has been previously created with the **saveallcnf** command.
- The switch configuration file from which you want to restore is stored in the C:/CNF directory.
- The PXM runtime software used by the saved configuration is stored in the C:/FW directory.

Caution Make sure that no other users are making configuration changes when you restore the configuration. The Cisco MGX switches do not check for other CLI or CWM users before restoring a configuration. If other users make changes while the file is being restored, the configuration can become corrupt, the switch can fail, and you might have to send switch cards back to the factory for reprogramming.

Caution Restoring a configuration replaces the existing configuration with the saved configuration. If there are configuration changes (such as MPSM license additions) that have been made since the last configuration save, those changes will be lost.

To restore a saved switch configuration, use the following procedure.

Step 1 Establish a configuration session using a user name with SERVICE_GP privileges or higher.

Step 2 Verify that the file from which you want to restore configuration data is located in the C:/CNF directory.

Note The C:/CNF directory is the only location from which you can restore a configuration file. If the file has been moved to another directory or stored on another system, the file must be returned to this directory before the data can be restored.

Tip Enter the **cd** command to navigate the C:/CNF directory, and enter the **ll** command to display the directory contents. For information on transferring files to and from the switch, see Appendix A, "Downloading and Installing Software Upgrades."

Step 3 Verify that the runtime software used by the saved configuration is located in the C:/FW directory.

Step 4 To restore a saved configuration file, enter the **restoreallcnf** command.

```
mgx8830a.1.PXM.a > restoreallcnf -f filename
```

Caution The **restoreallcnf** command resets all cards in the switch and terminates all calls passing through the switch.

Caution The configuration file saved with the **saveallcnf** command does not include the boot and runtime software files in use at the time of the save. If the PXM runtime software is missing, the following warning message appears:

```
**WARNING**: The version of firmware saved in the configuration file XYZ
is not present on the disk.
If you continue with the restore, before loading the image into C:/FW  the shelf
may not comeback up.
Do you still want to continue ? [Yes/No]
```

If this message appears, you should enter No and transfer the correct software to the C:/FW directory before restoring the configuration. The switch will start up if runtime service module software is missing, but service modules will not operate until the correct software versions are installed.

Replace *filename* with the name of the saved configuration file.You do not have to enter the path to the file or the extension. For information on the location and name of the file, see "Saving a Configuration," which appears earlier in this chapter.

Note If there were any license additions, deletions, or transfers performed after saving the restored configuration, the switch generates a minor license alarm if the number of licenses detected does not match the number of licenses restored. For more information, see Appendix F, “MPSM Licensing”.

Managing ILMI

The following sections describe how to

- Enable and disable the integrated local management interface (ILMI) feature on a port
- Display ILMI port configuration data
- Display and clear ILMI management statistics
- Delete ILMI prefixes

Enabling and Disabling ILMI on a Port

The Cisco MGX switches provide several commands that you can use to enable or disable ILMI on a port. For instructions on enabling or disabling ILMI from a PXM1E card, see the “Configuring ILMI on a Port” section in Chapter 3, “Provisioning PXM1E Communication Links.” For instructions on enabling or disabling ILMI from a AXSM card, see refer to the *Cisco ATM Services (AXSM) Configuration Guide and Command Reference for MGX Switches, Release 5*.

To enable or disable ILMI from the PXM prompt, use the following procedure.

Step 1 Establish a configuration session using a user name with GROUP1 privileges or higher.

Step 2 To display a list of ports and view the current ILMI status of each, enter the **dsppnports** command.

To enable or disable ILMI on a port, enter the **cnfilmienable** command as follows:

```
mgx8830a.1.PXM.a >cnfilmienable <portid> <no | yes>
```

Replace *portid* using the format *slot:bay.line:ifNum*. Table 9-1 describes these parameters.

Enter **yes** to enable ILMI on the port, or enter **no** to disable ILMI.

Table 9-1 Port Identification Parameters

Parameter	Description
slot	Enter the slot number for the card that hosts the port you are configuring.
bay	Replace *bay* with **1** if the line is connected to a back card in the upper bay, or replace it with **2** if the line is connected to a back card in the lower bay. Remember that the bay number is always **2** for a PXM1E, and **1** for an AXSM-1-2488
line	Replace *line* with the number that corresponds to the back card port to which the line is connected.
ifNum	An ATM port is also called an interface. Enter a number from 1 to 31 to identify this interface. The interface number must be unique on the card to which it is assigned. Interface numbers are assigned with the **addport** command.

Step 3 To verify the ILMI status change, re-enter the **dsppnports** command.

Displaying the ILMI Port Configuration

The following procedure describes some commands you can use to view the ILMI port configuration.

Step 1 Establish a configuration session using a user name with access privileges at any level.

Step 2 To display the ILMI configuration for all ports on a PXM1E or AXSM card, enter the **dspilmis** command. The following example shows the **dspilmis** command report:

```
mgx8830a.1.PXM.a > dspilmis

    Sig. rsrc  Ilmi  Sig  Sig Ilmi  S:Keepalive T:conPoll K:conPoll
    Port Part State  Vpi  Vci Trap  Interval    Interval  InactiveFactor
    ---- ----  ---- ---- ---- --- ------------  ---------- ----------
    1    1   Off     0    16    On          1          5          4
    3    1   Off     0    16    On          1          5          4
```

The example above shows that all ports are configured for the default ILMI values and that ILMI has not been started on any port. Table 9-2 describes each of the report columns.

Table 9-2 Column Descriptions for dspilmis and dspilmi Commands

Column	Description
Sig. Port	Port or logical interface for which ILMI status appears.
rsrc Part	Resource partition assigned to the port.
ILMI State	Configured ILMI state, which appears as either On or Off. The default ILMI state is Off, which indicates that ILMI is disabled on the port. You can enable ILMI signaling on the port by entering the **upilmi** command, which changes the state to On. Note that this column indicates whether ILMI is enabled or disabled. To see the operational state of ILMI, use the **dsppnport**, **dsppnports**, or **dsppnilmi** commands.
Sig Vpi	VPI for the ILMI signaling VCC.
Sig Vci	VCI for the ILMI signaling VCC.
Ilmi Trap	Indicates whether ILMI traps are enabled (On) or disabled (Off) for this port.
S:Keepalive Interval	Keep alive interval. The range is 1–65535 seconds.
T:conPoll Interval	Polling interval for T491 in the range 0–65535 seconds.
K:conPoll InactiveFactor	Polling interval K in the range 0–65535 seconds.

Step 3 To display the ILMI configuration for a single port, enter the **dspilmi** command as follows:

```
mgx8830a.1.PXM.a > dspilmi <ifnum> <partitionId>
```

Replace *ifnum* with the interface number of the port, and replace *partitionID* with the partition number assigned to the port. You can view both of these numbers in the **dspilmis** command report. The following is an example report for the **dspilmi** command. Table 9-2 describes each of the columns that appear in the command report.

```
mgx8830a.1.PXM.a > dspilmi 1 1

    Sig. rsrc  Ilmi  Sig  Sig Ilmi  S:Keepalive T:conPoll K:conPoll
    Port Part State  Vpi  Vci Trap  Interval    Interval  InactiveFactor
    ---- ----  ---- ---- ---- --- ------------  ---------- ----------
    1    1    On     0    16    On         1          5          4
```

Step 4 To display the operational state of ILMI on all ports, enter the **dsppnports** command at the PXM prompt as shown in the following example:

```
mgx8830a.1.PXM.a > dsppnports

Summary of total connections
(p2p=point to point,p2mp=point to multipoint,SpvcD=DAX spvc,SpvcR=Routed spvc)
Type   #Svcc:   #Svpc:   #SpvcD:  #SpvpD:  #SpvcR:  #SpvpR:  #Total:
p2p:   0        0        0        0        0        0        0
p2mp:  0        0        0        0        0        0        0
                                                       Total=0
Summary of total configured SPVC endpoints
Type   #SpvcCfg: #SpvpCfg:
p2p:   0         0
p2mp:  0         0

Per-port status summary

PortId         IF status         Admin status       ILMI state       #Conns

7.35           up                up                 Undefined        0

7.36           up                up                 Undefined        0

7.37           up                up                 Undefined        0

7.38           up                up                 Undefined        0

Type <CR> to continue, Q<CR> to stop:

10:1.1:1       up                up                 UpAndNormal      0
```

The ILMI operational state is displayed as one of the following: Disable, EnableNotUp, or UpAndNormal. When ILMI is disabled on the port, the operational status is Disable. When ILMI is enabled on the local port but cannot communicate with ILMI on the remote port, the status is EnableNotUp. In other words, the EnableNotUp status happens when ILMI is disabled on the remote end. When ILMI is enabled and communicating with ILMI on the remote port, the ILMI state is UpAndNormal.

Step 5 To display ILMI configuration data for a specific port, enter the **dsppnilmi** command at the PXM prompt as follows:

```
mgx8830a.1.PXM.a > dsppnilmi <portid>
```

Replace *portid* using the format *slot:bay.line:ifNum*. Table 9-1 describes these parameters. The following example shows the format of the **dsppnilmi** command report.

```
mgx8830a.1.PXM.a > dsppnilmi 10:1.1:1

Port:  10:1.1:1            Port Type:  PNNI             Side:  network
Autoconfig:  disable      UCSM: disable
Secure Link Protocol:  enable
Change of Attachment Point Procedures:  enable
Modification of Local Attributes Standard Procedure:  enable
Addressreg:  Permit All
```

```
VPI:        0                VCI:      16
Max Prefix:       16      Total Prefix:       0
Max Address:       64     Total Address:      0
Resync State:       0     Node Prefix: yes
Peer Port Id:     16848897   System_Id : 0.80.84.171.226.192
Peer Addressreg:  enable
Peer Ip Address : 0.0.0.0
Peer Interface Name : atmVirtual.01.1.1.01
ILMI Link State : UpAndNormal
ILMI Version : ilmi40

INFO:  No Prefix registered
```

Displaying and Clearing ILMI Management Statistics

The following procedure describes some commands you can use to view ILMI management statistics.

Step 1 To display ILMI management statistics for a port, enter the **dspilmicnt** command as follows:

```
mgx8830a.1.PXM.a > dspilmicnt <ifnum> <partitionId>
```

Replace ifnum with the interface number of the port, and replace partitionID with the partition number assigned to the port. You can view both of these numbers in the **dspilmis** command report. The following is an example report for the **dspilmicnt** command.

```
mgx8830a.1.PXM.a > dspilmicnt 1 1
If Number                 : 1
Partition Id              : 1
SNMP Pdu Received         : 36914
GetRequest Received       : 18467
GetNext Request Received  : 0
SetRequest Received       : 0
Trap Received             : 1
GetResponse Received      : 18446
GetResponse Transmitted   : 18467
GetRequest Transmitted    : 18446
Trap Transmitted          : 4
Unknown Type Received     : 0
ASN1 Pdu Parse Error      : 0
No Such Name Error        : 0
Pdu Too Big Error         : 0
```

Note Partition ID 1 is reserved for PNNI.

Step 2 To clear the ILMI management statistics for a port, enter the clrilmicnt command as follows:

```
mgx8830a.1.PXM.a > clrilmicnt <ifnum> <partitionId>
```

Replace *ifnum* with the interface number of the port, and replace partitionID with the partition number assigned to the port. The following example shows the switch response to this command.

```
mgx8830a.1.PXM.a > clrilmicnt 1 1
ilmi stats for ifNum 1, partId 1 cleared
```

Step 3 To verify that the statistics have been cleared, re-enter the **dspilmicnt** command.

Deleting ILMI Prefixes

The following procedure describes how to delete an ILMI address prefix from a port.

Note The procedure for adding ILMI prefixes is described in "Configuring ILMI Dynamic Addressing" in Chapter 3, "Provisioning PXM1E Communication Links."

Step 1 Establish a configuration session using a user name with GROUP1 privileges or higher.

Step 2 To view the ILMI prefixes assigned to a port, enter the **dspprfx** command as follows:

```
mgx8830a.1.PXM.a > dspprfx <portid>
```

Replace <portid> with the port address using the format slot:bay.line:ifnum. These parameters are described in Table 9-1. For example:

```
mgx8830a.1.PXM.a > dspprfx 10:2.2:4

INFO:  No Prefix registered
```

In the example above, no ILMI prefixes have been assigned to the port, so the port will use the prefix configured for the SPVC prefix.

Step 3 To prepare for deleting an ILMI prefix, down the port to be configured with the **dnpnport** command. For example:

```
mgx8830a.1.PXM.a > dnpnport 10:2.2:4
```

Step 4 Enter the following command to delete an ATM prefix for a port:

```
mgx8830a.1.PXM.a > delprfx <portid> <atm-prefix>
```

Replace *portid* using the format slot:bay.line:ifNum. Table 9-1 describes these parameters.

Replace *atm-prefix* with the 13-byte ATM address prefix in use.

Step 5 Up the port you configured with the **uppnport** command. For example:

```
mgx8830a.1.PXM.a > uppnport 10:2.2:4
```

Step 6 To verify the proper ATM prefix configuration for a port, re-enter the **dspprfx** command.

Determining the Software Version Number from Filenames

The following version management commands require a version number to be entered in a specific format:

- **abortrev**
- **burnboot**
- **commitrev**
- **loadrev**
- **runrev**
- **setrev**

In most cases, you will find the correct firmware version numbers in the *Release Notes for Cisco MGX 8850 (PXM1E/PXM45), Cisco MGX 8950, and Cisco MGX 8830 Switches, Release 5.0.00* and the *Release Notes for the Cisco MGX 8880 Media Gateway, Release 5.0.00*. If the release notes are not available, you can use the firmware filename to determine the version number as described below.

Step 1 Establish a configuration session at any access level.

Step 2 To view the files on the switch hard drive, you can enter UNIX-like commands at the switch prompt. To change directories to the firmware directory (FW), enter the **cd** command as follows:

```
mgx8830a.1.PXM.a > cd C:/FW
```

> **Note** Remember that UNIX directory and filenames are case sensitive.

Step 3 To list the contents of the directory, enter the **ll** command:

```
mgx8830a.1.PXM.a > ll
```

The following example shows the **ll** command display:

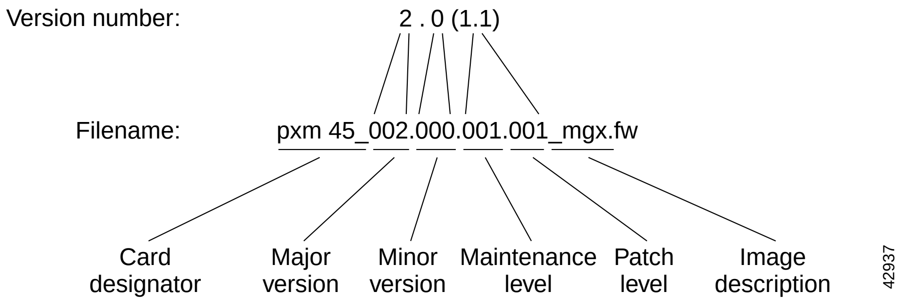
```
mgx8830a.1.PXM.a > ll

-rwxrwxrwx  1 0       0          1367596 Mar 12 18:27 ausm_8t1e1_020.000.000.106-D.fw
-rwxrwxrwx  1 0       0           967736 Apr 11 18:43 pxm1e_002.001.050.000-D_diag.fw
-rwxrwxrwx  1 0       0          6476612 Mar 29 23:51 pxm1e_003.000.000.000-D_mgx.fw
-rwxrwxrwx  1 0       0          1123104 Mar  6 18:26 pxm1e_003.000.000.000-D_diag.fw
-rwxrwxrwx  1 0       0          6412036 Feb 27 19:39 pxm1e_003.000.000.206-P1_m30.fw
-rwxrwxrwx  1 0       0          3810744 Feb 26 23:54 vism_8t1e1_003.000.000.051-I.fw
-rwxrwxrwx  1 0       0          3811160 Feb 26 19:21 vism_8t1e1_003.000.000.050-I.fw
-rwxrwxrwx  1 0       0          1085856 Jan  5  2000 pxm1e_001.001.050.005-A_diag.fw
-rwxrwxrwx  1 0       0          6327220 Feb  1 00:02 pxm1e_003.000.000.185-P2_m30.fw
-rwxrwxrwx  1 0       0          1015768 Feb  1 00:02 pxm1e_003.000.000.185-P2_bt.fw
-rwxrwxrwx  1 0       0          6331172 Jan 29 00:24 pxm1e_003.000.000.185-A_mgx.fw
-rwxrwxrwx  1 0       0           878976 Jan  1  2098 pxm1e_002.001.050.007-A_bt.fw
-rwxrwxrwx  1 0       0           725744 Mar 12 18:27 cesm_8t1e1_020.000.000.106-D.fw
-rwxrwxrwx  1 0       0           867564 Mar 12 18:27 frsm_8t1e1_020.000.000.106-D.fw
-rwxrwxrwx  1 0       0          1004548 Mar 12 18:28 frsm_vhs_020.000.000.106-D.fw
-rwxrwxrwx  1 0       0          6524548 May  3 00:38 pxm1e_003.000.000.000-D_m30.fw
-rwxrwxrwx  1 0       0          6505668 Apr 29 23:24 pxm1e_003.000.000.026-P4_m30.fw
In the file system :
    total space :  819200 K bytes
    free  space :  786279 K bytes
```

> **Note** The above example was created during product development. The filenames may be different from those in use on your switch. For the latest list of filenames, refer to the *Release Notes for Cisco MGX 8850 (PXM1E/PXM45), Cisco MGX 8950, and Cisco MGX 8830 Switches, Release 5.0.00* and the *Release Notes for the Cisco MGX 8880 Media Gateway, Release 5.0.00*.

Figure 9-1 shows the information contained in filenames for released software.

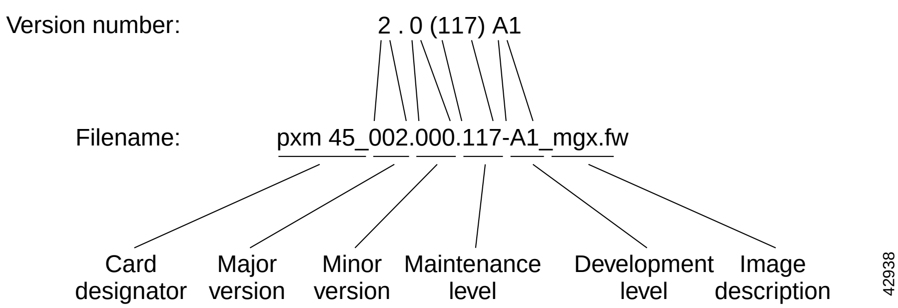
Figure 9-1 Filename Format for Released Software



Filenames that include "_mgx" are for runtime PXM firmware, and filenames that include "_bt" are for boot firmware. Service module runtime firmware images do not have an image description after the version number. When you first receive the switch from Cisco, there will be single versions of each file. If you download updates to any files, there will be multiple versions of those files.

Figure 9-2 shows the information contained in filenames for prereleased firmware. If you are evaluating nonreleased firmware, the filename format shows that the firmware is prereleased and indicates the development level of the prerelease firmware.

Figure 9-2 Filename Format for Prereleased Firmware



Step 4 Translate the filenames to version numbers, and write the numbers down so you can set the revision levels for the software.

Write the version number in the format required by the revision management commands. The following example shows the required format. If you are logged in as a user with SERVICE_GP access privileges, you can display this example by entering any of the revision management commands without parameters.

```
mgx8830a.1.PXM.a > runrev
ERR: Syntax: runrev <slot> <revision>
        slot -- optional; value: 15,16,31,32
           revision - revision number. E.g.,
                      2.0(1)
                      2.0(1.255)
                      2.0(0)I  or 2.0(0)A
                      2.0(0)P1 or 2.0(0)P2
                      2.0(0)P3 or 2.0(0)P4
                      2.0(0)D
                      2.0(1.166)I  or 2.0(1.166)A
                      2.0(1.166)P1 or 2.0(1.166)P2
                      2.0(1.166)P3 or 2.0(1.166)P4
```

The first example above, 2.0(1), is for released firmware version 2.0, maintenance release 1. The second example, 2.0(1.255), is for patch 255 to version 2.0, maintenance release 1. The other examples are for prerelease firmware. Prerelease firmware does not include patches; the maintenance release number is increased for each software change.

Table 9-3 shows some example filenames and the correct version numbers to use with the revision management commands.

Table 9-3 Determining Firmware Version Numbers from Filenames

Filename	Version Number for Revision Management Commands
ausm_8t1e1_020.000.001.047.fw	20.0(1.47)
axsm_002.000.001.001.fw	2.0(1.1)
axsm_002.000.016-D.fw	2.0(16)D
cesm_8t1e1_020.000.001.047.fw	20.0(1.47)
frsm_8t1e1_020.000.001.047.fw	20.0(1.47)
frsm_vhs_020.000.001.047.fw	20.0(1.47)
mpsm_t1e1_030.000.000.000.fw	30.0(0.0)
pxm1e_003.000.000.000_bt.fw	3.0(0.0)
pxm1e_003.000.001.000_bt.fw	3.0(1.0)
pxm1e_003.000.001-D_mgx.fw	3.0(1)D
pxm1e_003.000.014-A1_bt.fw	3.0(14)A1
pxm45_002.000.000.000_bt.fw	2.0(0.0)
pxm45_002.000.001.000_bt.fw	2.0(1.0)
pxm45_002.000.001-D_mgx.fw	2.0(1)D
pxm45_002.000.014-A1_bt.fw	2.0(14)A1
vism_8t1e1_003.000.000.103-I.fw	3.0(0.103)

Displaying Software Revisions for Cards

This section describes how to display software revision information for the cards in your switch.

Displaying Software Revisions in Use

To display the boot and runtime software version in use on every card in the switch, enter the **dsprevs** command as shown in the following example:

```
mgx8830a.1.PXM.a > dsprevs

Unknown                          System Rev: 03.00   May. 04, 2002 20:24:57 GMT
MGX8830                                              Node Alarm: MINOR
Phy. Log. Inserted       Cur Sw             Boot FW
Slot Slot Card           Revision           Revision
---- ---- --------       --------           --------

01   01   PXM1E-4-155    3.0(0.26)P4        3.0(0.26)A
02   01   PXM1E-4-155    3.0(0.26)P4        3.0(0.26)A
03   03   ---            ---                ---
04   04   FRSM_2CT3      ---                ---
05   05   FRSM_2CT3      ---                ---
06   06   CESM_8T1       ---                ---
07   07   SRM_3T3        ---                ---
08   08   ---            ---                ---
09   09   ---            ---                ---
10   10   ---            ---                ---
11   11   FRSM_8T1       ---                ---
12   12   ---            ---                ---
13   13   FRSM_8T1       ---                ---
14   07   SRM_3T3        ---                ---
```

To display the upgrades status of the runtime software on all switch cards, enter the **dsprevs -status** command as shown in the following example:

```
mgx8830a.1.PXM.a > dsprevs -status

Corvette                         System Rev: 03.00   Jun. 07, 2002 19:12:23 GMT
MGX8830                                              Node Alarm: MINOR
Phy. Log. Cur Sw           Prim Sw          Sec Sw           Rev Chg
Slot Slot Revision         Revision         Revision         Status
---- ---- --------         --------         --------         -------

01   01   3.0(0.83)D       3.0(0.83)D       3.0(0.83)D       ---
02   01   3.0(0.83)D       3.0(0.83)D       3.0(0.83)D       ---
03   03   ---              ---              ---              ---
04   04   20.0(1.44)A      20.0(1.44)A      20.0(1.44)A      ---
05   04   20.0(1.44)A      20.0(1.44)A      20.0(1.44)A      ---
06   06   20.0(1.44)A      20.0(1.44)A      20.0(1.44)A      ---
07   07   ---              ---              ---              ---
08   08   ---              ---              ---              ---
09   09   ---              ---              ---              ---
10   10   ---              ---              ---              ---
11   11   20.0(1.44)A      20.0(1.44)A      20.0(1.44)A      ---
12   12   ---              ---              ---              ---
13   13   ---              ---              ---              ---
14   07   ---              ---              ---              ---
```

Displaying Software Revisions for a Single Card

To display the boot and runtime software revisions in use on a single card, enter the **dspcd** <*slot*> command as shown in the following example:

```
mgx8830a.1.PXM.a > dspcd 2
Unknown                         System Rev: 03.00   May. 04, 2002 20:29:14 GMT
MGX8830                                             Node Alarm: MINOR
Slot Number    2    Redundant Slot:  1

                    Front Card          Upper Card          Lower Card
                    ----------          ----------          ----------

Inserted Card:      PXM1E-4-155         UI Stratum3         SMFIR_4_OC3
Reserved Card:      PXM1E-4-155         UI Stratum3         UnReserved
State:              Active              Active              Active
Serial Number:      S1234567890         SAK0325008J         SAG05415SW9
Prim SW Rev:        3.0(0.26)P4         ---                 ---
Sec SW Rev:         3.0(0.26)P4         ---                 ---
Cur SW Rev:         3.0(0.26)P4         ---                 ---
Boot FW Rev:        3.0(0.26)A          ---                 ---
800-level Rev:      E2                  03                  4P
800-level Part#:    800-12345-01        800-05787-01        800-18663-01
CLEI Code:          à0                                      0
Reset Reason:       On Power up
Card Alarm:         NONE
Failed Reason:      None
Miscellaneous Information:

Type <CR> to continue, Q<CR> to stop:
```

Managing Redundant Cards

The MGX switches support redundancy between two cards of the same type. For PXM1E, PXM45, and SRM cards, this redundancy is preconfigured on the switch. To establish redundancy between two CBSMs (for example, CESM, AUSM, FRSM, and VISM), two AXSMs, or two FRSM12s, you can enter the **addred** command as described in the "Establishing Redundancy Between Two Service Modules" section in Chapter 4, "Preparing Service Modules for Communication."

The following sections describe how to

- Display the redundancy configuration
- Switch operation from one card to the other
- Remove the redundancy between two service modules

Displaying Redundancy Status

To display the redundancy configuration for the switch, use the following procedure.

Step 1 Establish a configuration session at any access level.

Step 2 To view the redundancy status, enter the following command:

```
mgx8830a.1.PXM.a > dspred
```

After you enter the command, the switch displays a report similar to the following example:

```
mgx8830a.1.PXM.a > dspred
Unknown                            System Rev: 03.00   May. 04, 2002 20:31:39 GMT
MGX8830                                                Node Alarm: MINOR
Logical   Primary          Secondary           Card     Redundancy
Slot   Slot     Card     Slot       Red          Type        Type
                State               State
-----  ----- ----------- ----   ------------ ------------ ----------
  1     1    Standby      2     Active       PXM1E           1:1
  7     7    Standby      14    Active       SRM-3T3         1:1
```

Switching Between Redundant PXM Cards

When the switch has two PXM cards running in active and standby mode, you can enter the **swtichcc** command to swap the roles of the two cards. Typically, you enter this command to switch roles so you can upgrade the hardware or software on one of the cards.

Note The **switchcc** command is entered only when all cards are operating in active or standby roles. For example, if a non-active PXM is not in standby state, or if a service module is being upgraded, the **switchcc** command is not entered.

To switch operation from one redundant PXM card to another, use the following procedure.

Step 1 Establish a configuration session using a user name with SUPER_GP privileges or higher.

Step 2 Check the status of the active and standby cards by entering the **dspcds** command.

The **dspcds** command should list one card as active and one card as standby. If the cards are not in their proper states, the switchover cannot take place.

Step 3 To switch cards, enter the following command after the switch prompt:

```
mgx8830a.1.PXM.a > switchcc
```

Switching Between Redundant Service Modules

To switch operation from an active redundant service module to the standby card, use the following procedure.

Step 1 Establish a configuration session using a user name with SERVICE_GP privileges or higher.

Step 2 Check the status of the active and standby cards by entering the **dspcds** command.

The dspcds command should list one card as active and one card as standby. If the cards are not in their proper states, the switchover cannot take place.

Step 3 To switch cards, enter the following command after the switch prompt:

```
mgx8830a.1.PXM.a > switchredcd <fromSlot> <toSlot>
```

Replace <*fromSlot*> with the card number of the active card, and replace <*toSlot*> with the card number to which you want to switch control.

Removing Redundancy Between Two Cards

To remove the redundant relationship between two service modules, use the following procedure.

Step 1 Establish a configuration session using a user name with GROUP1_GP privileges or higher.

Step 2 To remove card redundancy, enter the following command after the switch prompt:

```
mgx8830a.1.PXM.a > delred <primarySlot>
```

Replace *primarySlot* with the number of the primary card. You can view the primary and secondary status of cards by entering the **dspred** command.

Switching Between Redundant RPM Cards

To switch operation from an active RPM-PR or RPM-XF card to the standby card, use the following procedure.

Step 1 Establish a configuration session using a user name with SERVICE_GP privileges or higher.

Step 2 Check the status of the active and standby cards by entering the **dspcds** command.

The **dspcds** command should list one card as active and one card as standby. If the cards are not in their proper states, the switchover cannot take place.

Step 3 To switch cards, enter the following command after the switch prompt:

```
mgx8850a.7.PXM.a > softswitch <fromSlot> <toSlot>
```

Replace <*fromSlot*> with the card number of the active card, and replace <*toSlot*> with the card number to which you want to switch control.

Managing Redundant APS Lines

APS line redundancy is supported on PXM1E, AXSM, and SRME cards. To establish redundancy between two lines, you can enter the **addapsln** command as described in the "Establishing Redundancy Between Two Lines with APS" section in Chapter 3, "Provisioning PXM1E Communication Links."

The following sections describe how to

- Prepare for Intercard APS
- Display APS line information
- Modify APS lines
- Switch APS lines
- Remove the redundancy between two lines

Note An APS connector is required for line redundancy on SRME cards that are installed in Cisco MGX 8850 (PXM1E) switches, and for line redundancy on PXM1E-8-155 cards in Cisco MGX 8850 (PXM1E) and Cisco MGX 8830 switches. An APS connector is not required for SRME cards that are installed in Cisco MGX 8830 switches.

Note You must install an APS connector and configure APS on your PXM1E-4-155 cards in order to facilitate a future upgrade to the PXM1E-8-155 card.

Preparing for Intercard APS

The following components are required for intercard APS:

- two front cards.
- two back cards for every bay hosting APS lines. All lines on cards used for intercard APS must operate in APS pairs or use Y cables.
- an APS connector installed between the two back cards for every bay hosting APS lines.

Enter the **dspapsbkplane** command on both the standby and active card to verify that the APS connector is plugged in properly. The following example shows the results displayed by the **dspapsbkplane** command when the APS connector is in place:

```
mgx8830a.1.PXM.a > dspapsbkplane

Line-ID   Primary Card Signal Status       Secondary Card Signal Status
                    Slot #1                             Slot #2
  1.1               PRESENT                             PRESENT
  1.2               PRESENT                             ABSENT
  2.1               PRESENT                             ABSENT
  2.2               PRESENT                             ABSENT

Remote Front Card : PRESENT
Top Back Card     : ENGAGED
Bottom Back Card  : ENGAGED
```

The following example shows the results displayed by the **dspapsbkplane** command when the APS connector is not place:

```
mgx8830a.1.PXM.a > dspapsbkplane

Line-ID   Primary Card Signal Status       Secondary Card Signal Status
                    Slot #1                              Slot #2
  1.1               PRESENT                              ABSENT
  1.2               ABSENT                               ABSENT
  2.1               PRESENT                              ABSENT
  2.2               ABSENT                               ABSENT

Remote Front Card : ABSENT
Top Back Card     : ENGAGED
Bottom Back Card  : NOT-ENGAGED
```

Note The **dspapsbkplane** command should be used only when the standby card is in the Ready state. When the standby card is booting or fails, intercard APS cannot work properly and this command displays "NOT ENGAGED."

If the **dspapsbkplane** command displays the message "APS Line Pair does not exist," suspect that the APS is not configured on a line.

If the **dspapsbkplane** command shows different values for each card in a pair of PXM1E, SRM, AXSME, or AXSM-XF cards, suspect that the APS connector is seated properly on one card but not on the other.

The APS connector status is the same for all lines in a single bay because the APS connector interconnects two back cards within the same bay. You need to enter the **dspapsbkplane** command only once to display the APS connector status for both upper and lower bays.

Enter the **dspapslns** command to verify APS configuration. If the working and protection lines show OK, both lines are receiving signals from the remote node.

Configuring Intercard APS Lines

In PXM1E, SRM, AXSME, or AXSM-XG intercard APS, either front card can be active, and can be connected to either APS line through the APS connector joining the two back cards. The following process describes how intercard APS communication works:

1. The signal leaves the front card at the remote end of the line.
2. The signal passes through the APS connector and both back card transmit ports at the remote end of the line.
3. The signal travels through both communication lines to the receive ports on both back cards at the local end.
4. The active front card processes the signal that is received on the active line.
5. The standby card monitors only the status of the standby line.
6. If necessary, the signal passes through the APS connector to the front card.

Note The front card monitors only one of the receive lines.

Line failures are always detected at the receive end of the line. This is where a switchover occurs when a failure is detected. Two different types of switchovers can occur, depending on whether the APS was configured as unidirectional or bidirectional in the **cnfapsln** command:

- When a failure occurs on a line configured for unidirectional switching, the switch changes lines at the receive end only. A switchover is not necessary at the transmit end because the transmitting back cards send signals on both lines in the 1 +1 APS configuration.
- When a failure occurs on a line configured for bidirectional switching, a switchover occurs at both ends of the line.

If the status of the standby line is good, a switchover from the failed active line to the standby is automatic.

Enter the **cnfapsln** command to enable an automatic switchover back to the working line after it recovers from a failure, as shown in the following example:

```
mgx8830a.1.PXM.a > cnfapsln -w 1.1.1 -rv 2
```

Table 9-4 describes the configurable parameters for the **cnfapsln** command.

Table 9-4 cnfapsln Command Parameters

Parameter	**Description**
-w <*working line*>	Slot number, bay number, and line number of the active line to configure, in the following format: `slot.bay.line` Example: `-w 1.1.1`
-sf <*signal fault ber*>	A number between 3 and 5 indicating the Signal Fault Bit Error Rate (BER), in powers of ten. • 3 = 10^{-3} • 4 = 10^{-4} • 5 = 10^{-5} Example: `-sf 3`
-sd <*SignalDegradeBER*>	A power if 10 in the range 5–9 that indicates the Signal Degrade Bit Error Rate (BER): • 5 = 10^{-5} • 6 = 10^{-6} • 7 = 10-7 • 8 = 10^{-8} • 9 = 10^{-9} Example: `-sd 5`
-wtr <*Wait To Restore*>	The number of minutes to wait after the failed working line has recovered, before switching back to the working line. The range is 5–12. Example: `-wtr 5`

Table 9-4 cnfapsln Command Parameters (continued)

Parameter	**Description**
-w <*working line*>	Slot number, bay number, and line number of the active line to configure, in the following format: `slot.bay.line` Example: `-w 1.1.1`
-dr <*direction*>	Determines whether the line is unidirectional or bidirectional. • 1 = Unidirectional. The line switch occurs at the receive end of the line. • 2 = Bidirectional. The line switch occurs at both ends of the line. **Note** This optional parameter is not shown in the above example because you do not need to set it for a revertive line. Example: `-dr 2`
-rv <*revertive*>	Determines whether the line is revertive or non-revertive. • 1 = Non-revertive. You must manually switch back to a recovered working line. • 2 = Revertive. APS automatically switches back to a recovered working line after the number of minutes set in the -wtr parameter. Example: `-rv 1`

If you want to manually switch from one line to another, enter the **switchapsln** <*bay*> <*line*> <*switchOption*> command, as shown in the following example:

```
mgx8830a.1.PXM.a > switchapsln 1 1 6
Manual line switch from protection to working succeeded on line 1.1.1
```

Table 9-5 describes the configurable parameters for the **switchapsln** command.

Table 9-5 switchapsln Command Parameters

Parameter	Description
bay	Working bay number to switch.
line	Working line number to switch.
switchOption	Method of performing the switchover. The possible methods are as follows: • 1 = Clear previous user switchover requests. Return to working line only if the mode is revertive. • 2 = Lockout of protection. Prevents specified APS pair from being switched over to the protection line. If the protection line is already active, the switchover is made back to the working line. • 3 = Forced working to protection line switchover. If the working line is active, the switchover is made to the protection line unless the protection line is locked out or in the SF condition, or if a forced switchover is already in effect. • 4 = Forced protection to working line switchover. If the protection line is active, the switch is made to the working line unless a request of equal or higher priority is in effect. This option has the same priority as option 3 (forced working to protection line switchover). Therefore, if a forced working to protection line switchover is in effect, it must be cleared before this option (forced protection to working line switchover) can succeed. • 5 = Manual switchover from working to protection line unless a request of equal or higher priority is in effect. • 6 = Manual switchover from protection to working line. This option is only available in the 1+1 APS architecture.
service switch	This is an optional parameter. When set to 1, this field causes all APS lines to switch to their protected lines.

Enter the **dspapslns** command to verify that the active line switched over from the protection line to the working line, as shown in the following example:

```
mgx8830a.1.PXM.a > dspapslns

Working Prot.  Conf  Oper    Active  WLine PLine WTR   Revt Conf Oper LastUser
Index   Index  Arch  Arch    Line    State State (min)      Dir  Dir  SwitchReq
------- -----  ----  -----   ------  ----- ----- ----- ---- ---- ---- ----------
  1.1.1  2.1.1 1+1    1+1    working    OK    OK     5  Yes   bi   bi ManualP->W
```

Displaying APS Line Information

To display the APS line redundancy configuration for a PXM card, enter the **dspapsln** command as described below.

Step 1 Establish a configuration session at any access level.

Step 2 To view the redundancy status, enter the following command after the switch prompt:

```
mgx8830a.1.PXM.a > dspapsln <working-slot.bay.line>
```

Replace <*working-slot.bay.line*> with the slot, bay, and line id of the APS line you want to display. After you enter the command, the switch displays a report similar to the following:

```
mgx8830a.1.PXM.a > dspapsln 9.1.1

Working Prot.  Conf    Oper    Active SFBer SDBer WTR   Revt Dir LastUser
Index   Index  Arch    Arch    Line   10^-n 10^-n (min)          SwitchReq
------- -----  ----    -----   ------ ----- ----- ----- ---- --- ----------
  9.1.1  9.1.2  1+1     1+1    working     3     5     5   No uni No Request
  9.2.1  9.2.2  1+1     1+1    working     3     5     5   No uni No Request
```

Modifying APS Lines

To change the configuration for an APS line, enter the **cnfapsln** command as described in the following procedure.

Step 1 Establish a configuration session using a user name with GROUP1_GP privileges or higher.

Step 2 Enter the **cnfapsln** command as follows:

```
mgx8830a.1.PXM.a > cnfapsln -w <workingIndex> -sf <SignalFaultBER> -sd <SignalDegradeBER>
-wtr <Wait To Restore> -dr <direction> -rv <revertive> -proto <protocol>
```

Select the working line to configure by replacing <*workingIndex*> with the with the location of the working line using the format slot.bay.line. For example, to specify the line on card 9, bay 1, line 2, enter 9.1.2.

Table 9-6 describes the **cnfapsln** command options.

Table 9-6 Options for cnfapsln Command

Option	Description
-w	Slot number, bay number, and line number of the active line to configure, in the following format: `slot.bay.line` Example: `-w 1.1.1`
-sf	The signal failure Bit Error Rate (BER) threshold. Replace <*SignalFaultBER*> with a number in the range of 3 to 5. 5 = signal failure BER threshold = 10 ^^ -5.
-sd	The Signal degrade BER threshold. Replace <*SignalDegradeBER*> with a number in the range of 5 to 9. 5 = signal degrade BER threshold = 10 ^^ -5.
-wtr	The number of minutes to wait before attempting to switch back to the working line. Replace <*Wait To Restore*> with a number in the range of 1 to 12 (minutes). Note that this option is applicable only when the **-rv** option is set to 2, enabling revertive operation.

Table 9-6 Options for cnfapsln Command (continued)

Option	Description
-dr	The direction option, which specifies the communication paths to be switched when a failure occurs. The options are unidirectional or bidirectional. When the unidirectional option is selected, only the affected path, either transmit or receive, is switched. When the bidirectional option is selected, both paths are switched. To set this option, replace the <*direction*> variable with **1** for unidirectional operation or **2** for bidirectional operation.
-rv	The revertive option, which defines how the switch should operate when a failed line recovers. The options are revertive and nonrevertive. When the **-rv** option is configured for revertive operation and the working line recovers, the switch will switch back to the working line after the period specified by the **-wtr** option. If the line is configured for nonrevertive operation, a failure on the working line will cause the switch to use the protect line until a manual switchover is initiated as described in "Switching APS Lines." To set this option, replace the <*revertive*> variable with **1** for non-revertive operation or **2** for revertive operation.
-proto	The protocol option, which determines whether the switch will use the standard Bellcore protocol, or the ITU protocol.

Switching APS Lines

To switch between two APS lines, enter the **switchapsln** command as described in the following procedure.

Step 1 Establish a configuration session using a user name with GROUP1_GP privileges or higher.

Step 2 Enter the **switchapsln** command as follows:

```
mgx8830a.1.PXM.a > switchapsln <bay> <line> <switchOption> <serviceSwitch>
```

Select the working line to switch by replacing <*bay*> with the bay number of the working line, and replacing <*line*> with the line number for the working line.

Table 9-7 describes the other options you can use with this command.

Table 9-7 Options for switchapsln Command

Option	Value	Description
switchOption	1	Clear
	2	Lockout of protection
	3	Forced working->protection
	4	Forced protection->working
	5	Manual working->protection
	6	Manual protection->working; applies only to 1+1 mode
serviceSwitch	0 or 1	0 switches specified line. 1 switches all lines.

Removing APS Redundancy Between Two Lines

To remove the redundant APS line relationship between two lines, enter the **delapsln** command as described in the following procedure.

Step 1 Establish a configuration session using a user name with GROUP1_GP privileges or higher.

Step 2 To remove redundancy between the two lines, enter the following command after the switch prompt:

```
mgx8830a.1.PXM.a > delapsln <workingIndex>
```

Select the working line to delete by replacing <*workingIndex*> with the location of the working line using the format slot.bay.line. In the following example, the **delapsln** command removes the APS redundancy between the working line at Card 1, Bay 2, Line 1 and the protection line associated with it.

```
mgx8830a.1.PXM.a > delapsln 1.2.1
```

Troubleshooting APS Lines

Port lights on PXM1E, SRM, AXSME, and AXSM-XG front cards indicate the receive status of APS lines. The active front card always displays the status of the active line. The standby card always displays the status of the inactive line. If only one APS line fails, the line failure LED is always displayed on the standby front card.

Caution When the active front card and the active line are in different slots and the inactive line has failed, it is easy to incorrectly identify the failed line as the line in the standby slot. To avoid disrupting traffic through the active line, verify which physical line is at fault before disconnecting the suspect line.

If the active line fails and the standby line is not available, the switch reports a critical alarm.

If the active line fails and the standby line takes over, the former standby line becomes the new active line, and the switch reports a major alarm.

If a PXM1E, SRM, AXSME, or AXSM-XG front card fails, APS communication between the redundant front cards fails. This can result in one of the following situations:

- If both APS lines were working before the failure, an APS line failure causes a switchover to the protection line
- If either APS line failed prior to a front card failure, a failure on the active line does not cause a switchover to the other line. Because the standby front card failed, it cannot monitor the standby line and report when the line has recovered. This means that the active card cannot use the standby line until the standby front card is replaced and the line problem corrected.

Use the following procedure to troubleshoot APS lines.

Step 1 Enter the **dsplns** command to determine if the line in alarm is an APS line. The **dsplns** command shows which lines are enabled for APS.

```
mgx8830a.1.PXM.a > dsplns

                                              Medium Medium
      Sonet  Line      Line      Line     Frame    Line   Line      Alarm   APS
      Line   State     Type      Lpbk    Scramble Coding Type      State   Enabled
      ----- ----- ------------ ------ -------- ------ -------   -----   --------
       1.1      Up sonetSts12c NoLoop   Enable  Other ShortSMF     Clear Enable
       1.2      Up sonetSts12c NoLoop   Enable  Other ShortSMF     Clear Disable
       2.1      Up sonetSts12c NoLoop   Enable  Other ShortSMF     Clear Disable
       2.2      Up sonetSts12c NoLoop   Enable  Other ShortSMF     Clear Disable
```

If the line in alarm is an APS line, and has always functioned properly as an APS line, proceed to Step 2.

If the line in alarm has never functioned properly as an APS line, verify that the following are true:

- Redundant front and back cards are in the appropriate bays and are installed at both ends of the line.
- Cable is properly connected to both ends of the line.
- Enter the **dspapsbkplane** command to verify that the APS connector is installed properly at both ends of the line.

Step 2 Enter the **dspapslns** command at both ends of the communication line to determine whether one or both lines in an APS pair are bad.

Use Table 9-8 to help you determine which APS line is not functioning properly.

Table 9-8 Troubleshooting APS Line Problems Using the dspaps Command

Active Line	Working Line	Protection Line	Working Line LED	Protection Line LED	Description
Working	OK	OK	Green	Green	Active card is receiving signal on working and protection lines. This does not guarantee that transmit lines are functioning properly. You must view the status on remote switch.
Protection	SF	OK	Green	Red	Active card is receiving signal on the protection line. No signal received on the working line.
Working	OK	SF	Green	Red	Active card is receiving signal on the working line. No signal received on the protection line.
Working	SF	SF	Red	Red	Active card is not receiving signal from either line. The working line was the last line to work.
Protection	SF	SF	Red	Red	Active card is not receiving signal from either line. The protection line was the last line to work.
Working	UNAVAIL	UNAVAIL			The card set is not complete. One or more cards have failed or been removed. See Table 9-9 to troubleshoot card errors.

Step 3 If one or both lines appear to be bad, determine whether the working or protection line is in alarm. Troubleshoot and correct the standby line first. Replace the components along the signal path until the problem is resolved.

- If the **dspapslns** command at either end of the line indicates a front or back card problem, resolve that problem first. (See Table 9-9 to troubleshoot card problems.)
- If the **dspapslns** command shows a signal failure on the standby line, replace that line.
- If the standby line is still down, replace the cards along the signal path.

Table 9-9 Troubleshooting Card Problems

APS Line Failure	Possible Cause
All lines in upper and lower bays.	Suspect a bad or removed front card. If both front cards are good, both back cards may be bad.
All lines in upper bay only. Lower bay APS lines OK.	Suspect bad upper bay back card.
All lines in lower bay only. Upper bay APS lines OK.	Suspect bad lower bay back card.

Managing the Time of Day Across the Network Using SNTP

Cisco MGX and SES products support the Simple Network Time Protocol (SNTP), which you can use to synchronize the time on all nodes in a network. The following sections describe how to do the following tasks:

- Enable and configure SNTP servers
- Display the current SNTP configuration
- Display an SNTP server
- Delete an existing SNTP server

Enabling and Configuring SNTP Servers

Clock synchronization is valuable for network clients with applications which need to have a reliable and accurate Time of Day (TOD). SES switches use SNTP to synchronize TOD clocks between a client and a server. An SNTP client can be configured to synchronize with one primary SNTP server and up to three secondary SNTP servers, and an SNTP server can support up to 200 clients.

In an SNTP server/client configuration, the SNTP client periodically requests TOD from the server. If the primary server is not available for some reason, the SNTP client switches over to the next available secondary server for TOD information until the primary server comes back up.

An SNTP server can reside on an active PXM in an MGX and in and SES switch. An SES switch an be an SNTP server, but not an SNTP client.

To set synchronized network clocks, you need to perform the following task in order:

1. Set up a primary server for the network client.
2. Set up a secondary server (or several secondary servers), which serves as a backup server if the SNTP client cannot reach the primary server.
3. Configure the network client.

To synchronize the primary and secondary servers, the SNTP client must be enabled on the node or nodes on which the servers are running. Since an SNTP client is not supported on an SES, The supported primary and secondary configurations are as follows:

- An SES is the primary server, and an MGX is the secondary server.
- An SES is the primary server, and another SES is the secondary server.

Use the following procedure to set up TOD synchronization in your network.

Note SNTP clients and servers run only on active PXM cards.

Step 1 Select a primary server that is able to provide reliable TOD information to the network.

Step 2 At the SES PXM1 prompt, enter the **cnfsntp *-server on -stratum*** <*stratum level* > command to enable the server and configure the stratum level. Replace <*stratum level* > with the stratum level for the server.

```
espses.1.PXM.a > cnfsntp -server on -stratum 1
```

Table 9-10 describes the **cnfsntp** command parameters you must use to set up a server.

Table 9-10 cnfsntp Command Parameters

Parameter	Description
-server	Toggles the primary SNTP server on or off.
-stratum	Stratum of the SNTP client. The default is 0.

Step 3 On an MGX node, set up an SNTP client to point to the SES SNTP server using the **addsntprmtsvr** as shown in the following example.

```
mgx.1.PXM.a > addsntprmtsvr <server IP address> on -version <version> -primary yes
```

Replace <*server IP address*> with the IP address of the SES server you set up in Step 1 and Step 2. Replace <*version*> with the SNTP version.

Table 9-11 describes the **cnfsntprmtsvr** command parameters you must use to set up a remote server.

Table 9-11 cnfsntprmtsvr Command Parameters

Parameter	Description
server IP address	The IP address of the switch you want to be a remote SNTP server.
version	The SNTP version you are using. Possible options are **3** and **4**. Default: **3**
-primary	This parameter lets you identify the switch as the primary SNTP server. Type **-primary yes** to make the primary server. To change the remote switch to a secondary server, type -**primary no**. Default: **no**

Note During power up, the PXM loads the TOD onto all cards in the switch except for the RPM. You must use the SNTP synchronize RPM cards to the MGX TOD.

Displaying the Current SNTP Configuration

Enter the **dspsntp** command at the active PXM prompt on the server to display the client requesting the TOD information from the current server.

```
M8850_NY.8.PXM.a > dspsntp

client: yes
server: yes

polling: 64
waiting: 5
rollback: 1024
stratum(default): 3
stratum(current): 3
sync: no
```

Table 9-12 shows the objects displayed for the **dspsntp** command.

Table 9-12 Objects Displayed for dspsntp Command

Parameter	Description
client:	Shows whether the SNTP client is turned **on** or **off**.
server:	Shows whether the SNTP server is turned **on** or **off**.
polling:	Shows the current number of seconds set on the polling timer. When this timer expires, the client requests TOD from the server.
waiting:	Shows the current number of seconds set on the waiting timer. If this timer expires three times, the client switches over to the first available secondary server for TOD. Default = 5 seconds

Table 9-12 Objects Displayed for dspsntp Command (continued)

Parameter	Description
rollback:	When a client switches over to the secondary server for TOD requests, the rollback timer takes affect and continues polling the primary server for TOD each time the rollback timer expires. The rollback timer continues polling the primary server until it comes back up. Default = 1024
stratum (default):	Shows the default stratum level.
stratum (current):	Shows the current settings for the stratum level.
sync:	Shows whether the SNTP client and server are in sync.

Displaying an SNTP Server

Enter the **dspsntprmtsvr** command at the active PXM prompt to display a specific SNTP server.

```
ses.1.PXM.a > dspsntprmtsvr 172.29.52.88
```

Enter the **dspsntprmtsvr** *all* command at the active PXM prompt to display a list of all existing SNTP servers in the network.

```
M8850_NY.8.PXM.a > dspsntprmtsvr all
```

Deleting an Existing SNTP Server

Enter the **delsntprmtsvr** <*IP_address*> command at the active PXM prompt to delete a specific SNTP server. Replace <*IP_address*> with the IP address of the server you want to delete.

```
M8850_LA.8.PXM.a > delsntprmtsvr 172.29.52.88
```

Enter the **delsntprmtsvr** *all* command to delete all SNTP servers on the network, as shown in the following example:

```
M8850_LA.8.PXM.a > delsntprmtsvr all
```

Managing NCDP Clock Sources

The following sections provide procedures for managing Network Clock Distribution Protocol (NCDP) clock sources.

Enabling NCDP on a Switch

By default, NCDP is disabled on all nodes and all NNI ports. To enable NCDP on a switch, enter the **cnfncdp** command as follows:

```
M8850_LA.8.PXM.a > cnfncdp [-distributionMode 1|2] [-maxNetworkDiameter diameter]
[-hello time] [ -holdtime time] [ -topoChangeTimer time]
```

Note NCDP must be enabled at each switch that will participate in NCDP clock distribution.

The -distributionMode option is the only option required to enable NCDP. Table 9-13 describes the options available for the **cnfncdp** command.

Table 9-13 cnfncdp Command Parameters

Parameter	Description
-distributionMode	This option selects either NCDP or manual mode clock distribution. To select NCDP mode, enter **1**. To select manual clock distribution, enter **2**. The default is 1 for NCDP.
-maxNetworkDiameter	This option specifies the maximum network diameter in hops. This is the maximum length of the spanning tree. The range is 3 to 200, and the default is 20.
-hello	This option specifies the NCDP hello packet interval. NCDP hello packets advertise the best network clock source. The range is 75 to 60000 milliseconds, and the default is 500 milliseconds.
-holdtime	This option specifies the hold time interval. The range is 75 to 60000 milliseconds, and the default is 500 milliseconds.
-topoChangeTimer	This option specifies the topology change timer interval. The range is 75 to 60000 milliseconds, and the default is 500 milliseconds.

Configuring an NCDP Clock Source

After you enable NCDP through the **cnfncdp** command, NCDP automatically selects the root clock source based on the following criteria:

- Priority (should be sufficient to find the root)
- Stratum level (should be sufficient as a tie-breaker)
- Clock source reference
- ATM address of the switch

You can manipulate these criteria and specify a clock source through the **cnfncdpclksrc** command as follows.

```
M8850_LA.8.PXM.a > cnfncdpclksrc <portid> <prstid> [-clocktype {e1 | t1}] [-priority
<priority>] [-stratumLevel <level>]
```

Table 9-14 describes the options available for the **cnfncdpclksrc** command.

Table 9-14 cnfncdpclksrc Command Parameters

Parameter	Description
port-id	Port identifier. For clocking ports on Cisco MGX 8850 (PXM1E/PXM45) and Cisco MGX 8950 switches, the port identifier is 7.35 or 7.36. For clocking ports on Cisco MGX 8830 switches, the port identifier is 1.35 or 1.36. For an internal oscillator, the port identifier is 255.255.
prs -id	Determines the primary reference source. Enter 0 for an external source, or 255 for an internal source.
-clocktype	Enter *e1* or *t1* as needed when the port ID is one of the following: • 7.35 or 7.36 in an MGX 8850 or MGX 8950 switch or in an MGX 8880 Media Gateway • 1.35 or 1.36 in an MGX 8830 chassis **Note** The default port type for 7.35/1.35 is E1. The default port type for 7.36/1.36 is T1. However, you can configure the BITS clocks portid 7.35/1.35 to be T1, or 7.36/1.36 to be E1, through the *-clocktype* parameter.
-priority	Prioritizes the clock source. Enter a number in the range from 1 to 255. Default = 128
-stratumLevel	Determines the stratum level of the clock source. Possible levels are 1, 2E, 2, 3E, 3, 4E, or 4. Default = 3

In the following example, the user configures an NCDP E1 clock source on port 7.35 with a external source, a priority of 100, and the stratum level 2.

```
M8850_LA.8.PXM.a > cnfncdpclksrc 7.35 0 -priority 100 -stratumLevel 2
```

Note Once you enable NCDP, it is automatically enabled on all NNI ports on the switch.

Enter the **dspncdpclksrc** <*portid*> command to ensure the NCDP configuration took effect. Replace <*portid*> with the 7.35 or 7.36 (for T1/E1 ports). The following example displays the NCDP configuration on an E1 port.

```
M8850_LA.8.PXM.a > dspncdpclksrc 7.35
Best clock source           : No
Priority                    : 100
Stratum level               : 2
Primary reference src id    : 0(external)
Health                      : Bad
```

Configuring an NCDP Port

Once you enable NCDP on your node, NCDP is automatically enabled on all the node's NNI ports. You can alter the default NCDP port configuration through the **cnfncdpport** <*portid*> <*options*> command, as shown in the following example:

```
M8850_LA.8.PXM.a > cnfncdpport 1:2.2:2 -ncdp enable -vpi 0 -vci 32 -admincost 1 -pcr 200
-scr 100  -mbs 50
```

Table 9-15 describes the **cnfncdpport** command options.

Table 9-15 cnfncdpport Command Parameters

Parameter	Description
portid	Port identifier in the format slot:bay.line:ifnum. These parameters are described in Table 9-1.
-ncdp	Enter **-ncdp enable** to enable NCDP on the current port. To disable NCDP on the port, **enter -ncdp** disable. Default = *enable* on NNI trunks and *disable* on virtual trunks
-vpi	Reserved VPI of the signaling channel, in the range from 0 through 4095. There is no reason to change this number unless a relevant card's partition is intended to support a specific VPI. **Note** If you change the VPI, it must be within the valid partition range or it will be disabled. **Note** You must disable NCDP before you modify the VPI of the signaling channel. Default = 0 for NNI trunks; and the minimum VPI in the configured range for virtual trunks.
-vci	Reserved VCI of the signaling channel, in the range from 32 through 65535. Normally, no reason exists to change it. **Note** If you change the VCI, it must be within the valid partition range or it will be disabled. **Note** You must disable NCDP before you modify the VCI of the signaling channel. Default = 34 for NNI trunks and virtual trunks.
-admincost	Sets the routing cost of the port, in the range from 1 through (2^24-1). For example, if the equipment is in an area with a large amount of electronic noise, or if the switch carries a particularly large amount of traffic, you might want to raise the cost.) Default = 10
-pcr	Specifies the PCR[1] for the port. Default = 250 cells per second

Table 9-15 cnfncdpport Command Parameters (continued)

Parameter	Description
-scr	Specifies the SCR[2] for the port. Default = 150 cells per second
-mbs	Specifies the MBS[3] for the port. Default = 100 cells

1. PCR = peak cell rate
2. SCR = sustained cell rate
3. MBS = maximun burst size

Enter the **dspncdpport** <*portid*> command to verify that the NCDP parameters were set properly.

```
M8850_LA.8.PXM.a > dspncdpport 1:2.2:2
Network clock mode              : enable
Ncdp Vc status                  : up
Network clock vpi               : 0
Network clock vci               : 34
Admin cost                      : 10
Service Category                : sig
PCR                             : 250
SCR                             : 150
MBS                             : 100

M8850_LA.8.PXM.a >
```

Displaying NCDP Information

The following sections describe how to display information about NCDP configuration in your network.

Display the Current NCDP Root Clock

Enter the **dspncdp** command to display the current NCDP root clock source on the network.

```
M8850_LA.8.PXM.a > dspncdp
Distribution Mode               : ncdp
Node stratum level              : 3
Max network diameter            : 20
Hello time interval             : 500 ms
Hold Down time interval         : 500 ms
Topology change time interval   : 500 ms
Root Clock Source               : 255.255
Root Clock Source Reason        : locked
Root Clock Source Status        : ok
Root Stratum Level              : unknown
Root Priority                   : 0
Secondary Clock Source          : 0.0
Secondary Clock Source Reason   : unknown
Secondary Clock Source Status   : unknown
Last Clock Source change time   : N/A
Last Clock Source change reason : None
```

Note When the switch is configured for manual clock distribution, the only parameter that is useful in the **dspncdp** display is the *Distribution Mode*.

Table 9-16 describes the objects displayed by the **dspncdp** command.

Table 9-16 dspncdp Command Objects

Parameter	Description
Distribution Mode	Current enabled method of clock distribution. If the method chosen is manual, NCDP is turned off, and vice-versa.
Node stratum level	Stratum level of the clock source. Possible levels are 1, 2E, 2, 3E, 3, 4E, or 4.
Max network diameter	Maximum network diameter measured in hops.
Hello time interval	Time interval between each configuration pdu sent out by a node to advertise the best clock source in the network. This time interval is specified in milliseconds in the display.
Holddown time interval	Number of milliseconds the switch waits before it transmits the next configuration PDU.
Topology change time interval	Time interval for which the topology change detection field in the configuration pdu bit will be set. Having the topology change detection option set informs the recipient node that it needs to transmit configuration pdus out to advertise to its neighbors about recent topology or root clock changes.
Root Clock Source	Clock port from which the node is deriving the clock signal. 255.255 means the node is deriving the clock source from an internal oscillator.
Root Clock Source Reason	The reason for the most recent change of a source of network clock. For a detailed description of the reasons a clock source can change, refer to Table 2-12 in the *Cisco MGX 8850 (PXM45/PXM1E), Cisco MGX 8950, Cisco MGX 8830, and Cisco MGX 8880 Command Reference, Release 5*.
Root Clock Source Status	Status of the network’s root clock source.
Root Stratum Level	Stratum level of the network’s root clock source. Possible levels are 1, 2E, 2, 3E, 3, 4E, or 4.
Root Priority	Priority of the network’s root clock source.
Secondary Clock Source	Secondary clock port from which the node is deriving the clock signal. 255.255 means the node is deriving the clock source from an internal oscillator.
Secondary Clock Source Reason	The reason for the most recent change of the secondary network clock source. For a detailed description of the reasons a clock source can change, refer to Table 2-12 in the *Cisco MGX 8850 (PXM45/PXM1E), Cisco MGX 8950, Cisco MGX 8830, and Cisco MGX 8880 Command Reference, Release 5*.
Secondary Clock Source Status	Status of the network’s secondary clock source.

Table 9-16 dspncdp Command Objects (continued)

Parameter	Description
Last clk src change time	Time when the root clock source last changed.
Last clk src change reason	Reason why the root clock source last changed.

Display A Specific NCDP Clock Source

Enter the **dspncdpclksrc** command to display configuration information about a specific NCDP clock sources on the network.

```
M8850_LA.8.PXM.a > dspncdpclksrc 7.35
Best clock source          : No
Priority                   : 100
Stratum level              : 2
Primary reference src id   : 0(external)
Health                     : Bad

M8850_LA.8.PXM.a >
```

Table 9-17 describes the objects displayed by the **dspncdpclksrc** command.

Table 9-17 dspncdpclksrc Command Objects

Parameter	Description
Best clock source	Describes whether the specified clock source is currently the best clock source in the node.
Priority	Displays the specified clock source's priority.
Stratum Level	Stratum level of the specified clock source. Possible levels are 1, 2E, 2, 3E, 3, 4E, or 4.
Primary reference src id	Displays the specified clock sources ID.
Health	Describes the current health of the specified clock source. The possible health states ar described below. Good—Specified clock source is the current root clock or the second best clock source, and is in good condition. Bad—Specified clock source was the root clock at some point, but went bad and is no longer available. Wideband-Locking—Specified clock source is being qualified by the clock manager and is in wideband-locking mode. Narrowband-Locking—Specified clock source is being qualified by the clock manager and is in narrowband-locking mode. Unknown—Specified clock source is not the root clock source.

Display All NCDP Clock Sources

Enter the **dspncdpclksrcs** command to display all configured NCDP clock sources on the network.

```
M8850_LA.8.PXM.a > dspncdpclksrcs

PortId    Best clk src    Priority   Stratum level  Prs id          Health
7.35 (e1) No              100        2              0(external)     Bad
7.36 (e1) No              128        3              0(external)     Bad
255.255   Yes             128        3              255(internal)   Good

M8850_LA.8.PXM.a >
```

Table 9-18 describes the objects displayed by the **dspncdpclksrcs** command.

Table 9-18 dspncdpclksrcs Command Objects

Parameter	Description
PortId	Current enabled method of clock distribution. If the method chosen is manual, NCDP is turned off, and vice-versa.
Best clk src	Displays *Yes* if a clock source is a root clock source or a second best clock source. Displays *No* if a clock source is not a root or second best clock source.
Priority	Priority of each clock source.
Stratum level	Stratum level of each clock source. Possible levels are 1, 2E, 2, 3E, 3, 4E, or 4.
Prs id	Primary source ID (prs-id) is either 0 for external or 255 for internal.The internal primary source is the free-running oscillator on the PXM back card. (Even though the syntax line and the CLI help indicates a range, the only choice in the current release is 0 or 255.) Default: 255
Health	Describes the current health of each clock source in the network. The possible health states ar described below. Good—Specified clock source is the current root clock or the second best clock source, and is in good condition. Bad—Specified clock source was the root clock at some point, but went bad and is no longer available. Wideband-Locking—Specified clock source is being qualified by the clock manager and is in wideband-locking mode. Narrowband-Locking—Specified clock source is being qualified by the clock manager and is in narrowband-locking mode. Unknown—Specified clock source is not the root clock source.

Display All NCDP Ports on the Switch

Enter the **dspncdpports** command to display general details about all signaling ports for NCDP.

```
U1.8.PXM.a > dspncdpports

PortId    Clock mode  Clock Vpi   Clock Vci   Admin Cost      Ncdp Vc
6:1.1:1   disable     0           34          10              down
6:1.1:2   disable     0           34          10              down
6:1.1:3   disable     0           34          10              down
```

Table 9-19 describes the objects displayed by the **dspncdpports** command.

Table 9-19 dspncdpports Command Objects

Parameter	Description
PortId	Port identifier in the format slot:bay.line:ifnum. Table 9-1 describes these parameters.
Clock mode	Displays whether NCDP is enabled or disabled on each port.
Clock VPI	Displays the VPI of the signaling channel for each port.
Clock VCI	Displays the VCI of the signaling channel for each port.
Admin Cost	Displays the routing cost of the port.
NCDP VC	Displays whether the Ncdp VC is up or down.

Display An NCDP Port

Enter the **dspncdpport** <*portid*> command to display detailed information for a specified NCDP signaling port. Replace <*portid*> with the port identifier in the format slot:bay.line:ifnum.

```
U1.8.PXM.a > dspncdpport 6:1.1:1
Network clock mode              : disable
Ncdp Vc status                  : down
Network clock vpi               : 0
Network clock vci               : 34
Admin cost                      : 10
Service Category                : sig
PCR                             : 250
SCR                             : 150
MBS                             : 100
```

Table 9-20 describes the objects displayed by the **dspncdpport** command.

Table 9-20 dspncdpport Command Objects

Parameter	Description
Network clock mode	Displays whether NCDP is enabled or disabled on each port.
NCDP Vc status	Displays whether the Ncdp VC is up or down.
Network clock VPI	Displays the VPI of the signaling channel for each port.
Network clock VCI	Displays the VCI of the signaling channel for each port.
Admin Cost	Displays the routing cost of the port.
Service Category	Displays the service category for the current NCDP port.

Table 9-20 dspncdpport Command Objects

Parameter	Description
PCR	Displays the PCR[1] for the port.
SCR	Displays the SCR[2] for the port.
MBS	Displays the MBS[3] for the port.

1. PCR = peak cell rate
2. SCR = sustained cell rate
3. MBS = maximun burst size

Deleting an NCDP Clock Source

Enter the **delncdpclksrc** <*portid*> [clocktype <*e1* | *t1*>] command to delete a clock source from the network. describes how to set the <*portid*> and [clocktype] parameters on all possible switches and cards.

Table 9-21 delncdpclksrc Command Objects

Parameter	Description
portid	The format of the PNNI physical port identifier can vary, as follows: • On a PXM45: slot:subslot.port:subport • On a PXM1E for UNI/NNI back card: slot:subslot.port:subport. On the UNI/NNI back card, the subslot is always 2, but the slot depends on the chassis, as follows: – In an MGX 8850 chassis, slot is always the logical slot 7. – In an MGX 8830 chassis, slot is always the logical slot 1. • On a PXM1E for a service module: slot.port. For BITS clocks only, the default portid is 7.35(for E1 ports) or 7.36 (for T1 ports).In an MGX 8830 chassis, the default portid for BITS is either 1.35 (for E1 ports) or 1.36 (for T1 ports). **Note** If the *portid* was modified, so that the BITS clocks portid 7.35/1.35 has been configured as a T1 (instead of an E1 port), or if 7.36/1.36 has been configured to be an E1 port (instead of a T1 port), then you must specify the *clocktype* in the **delncdpclksrc** command.
clocktype	Enter *e1* or *t1* as needed when the port ID is one of the following: • 7.35 or 7.36 in an MGX 8850 or MGX 8950 switch or in an MGX 8880 Media Gateway • 1.35 or 1.36 in an MGX 8830 chassis If the clock type is the default E1, this parameter is not necessary for port IDs 7.35 or 7.36 (or 1.35.or 1.36). Default: e1

In the following example, the user deletes the clock source from the E1 port number 7.35 on a Cisco MGX 8850 (PXM45) switch.

```
M8850_LA.8.PXM.a > delncdpclksrc 7.35

M8850_LA.8.PXM.a >
```

Managing Manually Configured Clocks Sources

The following sections provide commands and procedures for managing manually configured clock source.

View the Configured Clock Sources

One command allows you to view the configured clock sources and determine which clock source is active. To view the configured clock sources, use the following procedure.

Step 1 Establish a configuration session at any access level.

Step 2 Enter the **dspclksrcs** command.

```
mgx8830a.1.PXM.a > dspclksrcs
```

The following example shows a display with neither primary nor secondary clocks configured. This is the default configuration of a switch, which uses the internal clock as the network clock source. Whenever the active clock is listed as null, the switch is using the internal clock.

```
mgx8830a.1.PXM.a > dspclksrcs
Primary clock type:     null
Primary clock source:   0.0
Primary clock status:   not configured
Primary clock reason:   okay
Secondary clock type:   null
Secondary clock source: 0.0
Secondary clock status:   not configured
Secondary clock reason:   okay
Active clock:           internal clock
source switchover mode: non-revertive
```

In the following example, the display shows that both the primary and secondary clocks are configured for network clock sources. The primary clock source is coming from port 1 on the PXM1E card in slot 1. The primary clock source is active. The secondary clock source is coming from port 1 on the CESM card in slot 6.

```
mgx8830a.1.PXM.a > dspclksrcs
Primary clock type:     generic
Primary clock source:   1:2.2:1
Primary clock status:   ok
Primary clock reason:   okay
Secondary clock type:   generic
Secondary clock source: 6:1.1:1
Secondary clock status:   ok
Secondary clock reason:   okay
Active clock:           primary
source switchover mode: non-revertive
```

Reconfigure Manual Clock Sources

The procedure you use to reconfigure a clock source depends on whether or not you need to change the role of the clock source. If the clock source keeps its role as either primary or secondary, just enter a new **cnfclksrc** command as described in the following locations:

- To reconfigure a clock source for a BITS clock, see the "Configuring the MPLS Controller" section in Chapter 2, "Configuring General Switch Features."
- To reconfigure a clock source to use a PXM1E line, see the "Configuring PXM1E Line Clock Sources" section in Chapter 3, "Provisioning PXM1E Communication Links."
- To reconfigure a clock source to use a AXSM line, see refer to the *Cisco ATM Services (AXSM) Configuration Guide and Command Reference for MGX Switches, Release 5*.

When reconfiguring a clock source from primary to secondary or from secondary to primary, you must delete both existing clock sources and define new clock sources. The switch will not allow you to create two primary or two secondary clock sources, and the switch will not allow you to configure the same line as both primary and secondary clock sources. After you have deleted the old clock source, you can use the appropriate procedure (referenced above) to define a new clock source.

To delete a clock source, enter the **delclksrc** command as described in the next section.

Delete Manual Clock Sources

Deleting a clock source deletes the definition of the clock source, not the clock source itself. You might want to delete a primary or secondary clock source definition so that you can reassign the clock source to another line.

To delete a clock source, use the following procedure.

Step 1 Establish a configuration session using a user name with SUPER_GP privileges or higher.

Step 2 Display the clock source information by entering the **dspclksrcs** command.

You will need the information in this display to delete the clock source.

Step 3 To delete a clock source, enter the **delclksrc** command.

```
mgx8830a.1.PXM.a > delclksrc <priority>
```

The following example deletes a primary clock source:

```
mgx8830a.1.PXM.a > delclksrc primary
```

Step 4 To verify that a clock source has been deleted, enter the **dspclksrcs** command. When the primary or secondary clock source is deleted, the clock type is set to **null**.

Restore a Manual Clock Source After Failure

The *revertive* option for clock sources connected to the PXM allows a primary clock source to resume operation as the primary clock source after a failure and restoration of the clock signal. However, if you have the revertive option disabled, you will have to manually reconfigure a failed primary clock source after it recovers before it can resume operation as the primary clock source.

To reconfigure a BITS clock source, see the "Manually Configuring BITS Clock Sources" section in Chapter 2, "Configuring General Switch Features." To reconfigure a PXM1E line clock source, see the "Configuring PXM1E Line Clock Sources" section in Chapter 3, "Provisioning PXM1E Communication Links." To reconfigure an AXSM line clock source, refer to the *Cisco ATM Services (AXSM) Configuration Guide and Command Reference for MGX Switches, Release 5*.

Tip Enter the **dspclksrcs** command to display the current configuration settings for the primary clock source. Having this information available makes it easier to re-enter the **cnfclksrc** command.

Note To change a clock source on the PXM from nonrevertive to revertive, enter the **cnfclksrc** with the option **–revertive enable**.

When the primary clock source is restored on the master clock node, you may have to reconfigure the primary clock source at each remote node where the node has switched from the primary source to the secondary source. This reconfiguration is necessary only if the local node has detected a change in the master clock source.

To determine if you need to reconfigure the primary clock at a nonmaster node, enter the **dspclksrcs** command. If the active clock has changed to either secondary or internal clock, you must use the **cnfclksrc** command to reconfigure the primary clock source for that node.

Displaying SVCs

To display active SVCs, use the following procedure.

Step 1 Establish a CLI management session at any user access level.

Step 2 Enter the following command:

```
mgx8830a.1.PXM.a > dsppncons
```

The following is an example report for the **dsppncons** command.

```
mgx8830a.1.PXM.a > dsppncons

       Port   VPI   VCI CallRef:Flag X-Port    VPI   VCI  CallRef:Flag  Type  OAM-Type Pri
    9:1.1:1     0    32      1: 0    9:1.2:2      0    36       5: 0    PTP    No      3
Calling-Addr:47.666666666666666666666666.666666666666.00
Called-Addr: 47.111111111111111111111111.111111111111.64
    9:1.2:2     0    36      5       9:1.1:1      0    32       1: 0    PTP    No      3
Calling-Addr:47.666666666666666666666666.666666666666.00
Called-Addr: 47.111111111111111111111111.111111111111.64
```

Managing Controllers

Cisco MGX switches support one PNNI controller, and Cisco MGX 8850 (PXM45)and Cisco MGX 8950 switches support up to two Label Switch Controllers. The controller identifies a network control protocol to the Virtual Switch Interface (VSI) that runs on the node.

Adding Controllers

To add a controller, use the following procedure.

Step 1 Establish a configuration session at any user access level.

Step 2 Enter the **addcontroller** command to add a controller to the node.

```
mgx8830a.1.PXM.a > addcontroller <cntrlrId> i <cntrlrType> <lslot> [cntrlrName}
```

Table 9-22 describes the parameters for this command.

Table 9-22 Parameters for the addcontroller Command

Parameter	Description
<*cntrlrId*>	Number that identifies a network controller. The numbers are reserved as follows: • 2 = PNNI • 3 = Label Switch Controller (LSC), also known as Multiprotocol Label Switch Controller (MPLS). This option is not supported on PXM1E cards. **Note** The controller ID (*cntrlrId*) must be the same as the controller type (*cntrlrType*).
i	Keyword indicating that this controller is internal.
<*cntrlrType*>	Number that identifies a network controller. The numbers are reserved as follows: • 2 = PNNI • 3 = LSC (Label Switch Controller, also known as MPLS. This option is not supported on PXM1E cards. **Note** The controller type (*cntrlrType*) must be the same as the controller ID (*cntrlrId*).
<*lslot*>	The logical slot number on which the controller resides. For the PXM-45, *lslot* is *7* regardless of which card is active.
[*cntrlrName*}	(Optional) A string to serve as a name for the controller.

Step 3 To display all controllers on the switch and verify the added controller, enter the **dspcontrollers** command.

```
MGX8850.7.PXM.a > dspcontrollers

Controller Bay Number:        0
Controller Line Number:       0
Controller VPI:               0
Controller VCI:               0
Controller In Alarm:          NO
Controller Error:
MGX8850                         System Rev: 02.00   Jul. 30, 2000 09:39:36 GMT
MGX8850                                              Shelf Alarm: NONE
Number of Controllers:        1
Controller Name:              PNNITWO
Controller Id:                2
Controller Location:          Internal
Controller Type:              PNNI
Controller Logical Slot:      7
```

Deleting a Controller

To delete a controller, use the following procedure.

Step 1 Establish a configuration session at any user access level.

Step 2 Enter the **delcontroller** command to prevent the switch from using a specified controller.

```
mgx8830a.1.PXM.a > delcontroller <cntrlrId>
```

Replace <*cntrlrId*> with *2* to identify PNNI controller, or *3* to identify an LSC controller.

Caution Do not enter the **delcontroller** command on a card with existing connections. If you do, those connections cannot be recovered until the controller is re-added using the **addcontroller** command, and the cards or the entire node is reset. Otherwise, ports remain in the provisioning state.

Step 3 To verify that the switch is no longer using the specified controller, enter the **dspcontrollers** command.

Note The **delcontroller** command does not delete the controller software, but directs the switch not to use it.

Viewing an ATM Port Configuration

To view the configuration of an ATM line or trunk port, use the following procedure.

Step 1 Establish a CLI management session at any user access level.

Step 2 To display a list of the ports already configured on a PXM1E or AXSM card, enter the following command:

```
mgx8830a.1.PXM.a > dspports
```

This command displays all configured ports on the PXM1E or AXSM card. Port numbers are listed in the ifNum (interface number) column. The interfaces listed include UNI and NNI ports. Note the number of the port for which you want to view the configuration.

Step 3 To display the port configuration, enter the following command:

```
mgx8830a.1.PXM.a > dspport <ifNum>
```

Replace *ifNum* with the number assigned to the port during configuration. The following example shows the report for this command:

```
mgx8830a.1.PXM.a > dspport 2

  Interface Number               : 2
  Line Number                    : 2.1
  Admin State                    : Up         Operational State    : Down
  Guaranteed bandwidth(cells/sec): 100000     Number of partitions: 1
  Maximum bandwidth(cells/sec)   : 100000     Number of SPVC      : 0
  ifType                         : NNI        Number of SVC       : 0
  SCT Id                         : 6
  VPI number(VNNI only)          : 0
```

Managing PXM1E Partitions

The following sections describe how to display, change, and delete a resource partition.

Note Resource partitions can be managed on AXSM, FRSM12, MPSM, and PXM1E cards. This section describes how to manage partitions on PXM1E cards. For instructions on managing resource partitions on other types of cards, see the service module documentation listed in Table 1-1.

Displaying a PXM1E Resource Partition Configuration

To display a list of resource partitions or a resource partition configuration, use the following procedure.

Step 1 Establish a CLI management session at any user access level.

Step 2 To display a list showing the resource partitions on this card, enter the following command:

```
mgx8830a.1.PXM.a > dspparts
```

The switch displays a report similar to the following:

```
mgx8830a.1.PXM.a > dspparts

if   part Ctlr egr     egr     ingr    ingr    min max   min   max   min   max
Num  ID   ID   GuarBw  MaxBw   GuarBw  MaxBw   vpi vpi   vci   vci   conn  conn
             (.0001%)(.0001%)(.0001%)(.0001%)
-----------------------------------------------------------------------------
 1   1     2 1000000 1000000 1000000 1000000    0 4095    35 65535  10000  10000
 2   1     2 1000000 1000000 1000000 1000000    0  255    35 65535   5000   5000
```

Step 3 To display the configuration of a resource partition, note the interface and partition numbers and enter the following command:

```
mgx8830a.1.PXM.a > dsppart <ifNum> <partId>
```

Replace *ifnum* with the interface number of the port, and replace *partitionID* with the partition number assigned to the port. The following example shows the report provided by the **dsppart** command.

```
mgx8830a.1.PXM.a > dsppart 1 1

  Interface Number               : 1
  Partition Id                   : 1        Number of SPVC: 0
  Controller Id                  : 2        Number of SPVP: 0
  egr Guaranteed bw(.0001percent): 1000000  Number of SVC : 2
  egr Maximum bw(.0001percent)   : 1000000
  ing Guaranteed bw(.0001percent): 1000000
  ing Maximum bw(.0001percent)   : 1000000
  min vpi                        : 0
  max vpi                        : 4095
  min vci                        : 32
  max vci                        : 65535
  guaranteed connections         : 10000
  maximum connections            : 10000
```

Note Partition ID 1 is reserved for PNNI.

Changing a PXM1E Resource Partition Configuration

To change the configuration of a resource partition, use the following procedure.

Step 1 Establish a configuration session using a user name with GROUP1 privileges or higher.

Step 2 To display a list showing the partitions for this card, enter the **dspparts** command.

Note You can change a resource partition only when the partition is not in use.

Step 3 To create a resource partition on a PXM1E or AXSM card, enter the **cnfpart** command as shown in the following example:

```
mgx8830a.1.PXM.a > cnfpart -if <ifNum> -id <partId> -emin <egrminbw> -emax <egrmaxbw>
-imin <ingminbw> -imax <ingmaxbw> -vpmin <minVpi> -vpmax <maxVpi> -vcmin <minVci> -vcmax
<maxVci> -mincon <minConns> -maxcon <maxConns>
```

To create a resource partition on a FRSM12 card, enter the **cnfpart** command as shown in the following example:

```
mgx8830a.1.PXM.a > cnfpart -if <ifNum> -ctlrnum <controllerNum>] [-lcn <available
connections>] [-dlcimin <minDlci>] [-dlcimax <maxDlci> [-ibw <ingPctBw>] [-ebw <egrPctBw>]
```

Table 9-23 describes the parameters for the **cnfpart** command. Be sure to configure only the parameters that are appropriate for the card you are configuring.

Table 9-23 Parameters for the cnfpart Command

Parameter	Description
ifNum	Interface number or port number. This number identifies the port this resource partition configures. Enter the interface number that was assigned to the port when it was configured.
controllerNum	Controller number. 1 = PAR (Portable AutoRoute)—Not supported in this release. 2 = PNNI—Only PNNI is supported in this release. 3 = TAG (MPLS)—Not supported in this release. **Note** This parameter applies only to FRSM12 cards.
partId	Partition identification number. Enter a number in the range of 1 to 20. Partition ID 1 is reserved for PNNI. **Note** This parameter applies only to PXM1E and AXSM cards.
egrminbw	Egress minimum bandwidth. Enter the minimum percentage of the outgoing port bandwidth that you want assigned to the specified controller. One percent is equal to 0.00001 units. For example, an <*egrminbw*> of 250000 = 25%. The sum of the minimum egress bandwidth setting for PNNI must be 100% or less, and must be less than the sum of the egrmaxbw settings. **Note** This parameter applies only to PXM1E and AXSM cards.
egrmaxbw	Egress maximum bandwidth. Enter the maximum percentage of the outgoing port bandwidth that you want assigned to the controller. One percent is equal to 0.00001 units. For example, an <*egrmaxbw*> of 1000000 = 100%. The sum of the maximum egress bandwidth settings for PNNI can exceed 100%, and must be more than the sum of the egrminbw settings. Available bandwidth above the minimum bandwidth settings is allocated to the operating controllers on a first-request, first-served basis until the maximum bandwidth setting is met or there is insufficient bandwidth to meet the request. **Note** This parameter applies only to PXM1E and AXSM cards.
ingminbw	Ingress minimum bandwidth. Enter the minimum percentage of the incoming port bandwidth that you want assigned to the controller. One percent is equal to 0.00001 units. For example, an <*ingminbw*> of 500000 = 50%. The sum of the minimum ingress bandwidth settings for PNNI must be 100% or less, and must be less than the sum of the ingmaxbw settings. **Note** This parameter applies only to PXM1E and AXSM cards.
ingmaxbw	Ingress maximum bandwidth. Enter the maximum percentage of the incoming port bandwidth that you want assigned to the controller. One percent is equal to 0.00001 units. For example, an <*ingmaxbw*> of 750000 = 75%. The sum of the maximum ingress bandwidth settings for PNNI can exceed 100%, and must be more than the sum of the ingminbw settings. Available bandwidth above the minimum bandwidth settings is allocated to the operating controllers on a first-request, first-served basis until the maximum bandwidth setting is met or there is insufficient bandwidth to meet the request. **Note** This parameter applies only to PXM1E and AXSM cards.

Table 9-23 Parameters for the cnfpart Command (continued)

Parameter	Description
minVpi	Minimum VPI number for this port. For UNI ports, enter a value in the range from 0 to 255. For NNI ports, enter a value in the range from 0 to 4095. **Note** This parameter applies only to PXM1E and AXSM cards.
maxVpi	Maximum VPI number for this port. For UNI ports, enter a value in the range from 0 to 255. For NNI ports, enter a value in the range from 0 to 4095. The value for <*maxVpi*> cannot be less than for <*minVpi*>. **Note** This parameter applies only to PXM1E and AXSM cards.
minVci	Minimum VCI number for this port. Enter a number in the range from 32 to 65535. To support features planned for the future, Cisco recommends setting the minimum VCI to 35 or higher. **Note** This parameter applies only to PXM1E and AXSM cards.
maxVci	Maximum VCI number for this port. Enter a number in the range from 32 to 65535. **Note** This parameter applies only to PXM1E and AXSM cards.
minConns	Specifies the guaranteed number of connections. On the PXM1E UNI/NNI, the ranges vary according to the line types, as follows: • For OC3, T3, and E3 lines, the range is 10-27000. • For T1 and E1 lines, the range is 10-13500. On the AXSM series of cards, the range is 10 through the maximum number of connections in the port group. **Note** This parameter applies only to PXM1E and AXSM cards.
maxConns	Maximum number of simultaneous connections allowed on this port. The range is the same as described for the <*minConns*> parameter. This parameter must be set to number that is greater than the number defined for <*minConns*>. **Note** This parameter applies only to PXM1E and AXSM cards.
available connections	Logical channel number. Range: 0–16000. **Note** This parameter applies only to FRSM12 cards.
minDlci	Lowest data-link connection identifier (DLCI). A value that specifies the DLCI in a Frame Relay network: • Two-byte header—Range: 1–1023 • Four-byte header—Range: 0–8388607 The value specified must be *n* * 32768, where *n* is a number from 0 to 255. **Note** This parameter applies only to FRSM12 cards.
maxDlci	Highest data-link connection identifier (DLCI). A value that specifies a DLCI in a Frame Relay network: • 2-byte header—Value range: 1 –1023 • 4-byte header—Value range: 0 –8388607 The value specified must be (*n* * 32768)-1, where *n* is a number from 1 to 256. **Note** This parameter applies only to FRSM12 cards.

Table 9-23 Parameters for the cnfpart Command (continued)

Parameter	Description
ingPctBw	Percentage of ingress bandwidth available to the connection. Range: 0–100 percent. **Note** This parameter applies only to FRSM12 cards.
egrPctBw	Percentage of egress bandwidth available to the connection. Range: 0–100 percent. **Note** This parameter applies only to FRSM12 cards.

Step 4 To display the changed partition configuration, enter the **dsppart** command as described in the previous section.

Note The current software release does not support dynamic changes to partitions. To begin using changes to a resource partition, you need to delete the controller and then add the controller as described in the Step 5 through Step 8 of this procedure.

Step 5 Display the available controllers with the **dspcontrollers** command, and write down the controller settings for the controller you are about to delete. For example:

```
mgx8830a.1.PXM.a > dspcontrollers
```

Step 6 Enter the **delcontroller** command to delete the controller that corresponds to the resource partition you modified. For example:

```
pop20two.7.PXM.a > delcontroller 3
All Ports and Connections
        on this controller will be deleted.
delcontroller: Do you want to proceed (Yes/No)? y
```

Step 7 To register the resource partition changes, add the deleted controller with the **addcontroller** command. For example:

```
pop20two.7.PXM.a > addcontroller 3 i 3 7 "PNNI Controller"
```

Step 8 To verify that the controller was added correctly, enter the **dspcontrollers** command.

Deleting a PXM1E Resource Partition

To delete a resource partition, you must do the following:

- Delete any connections that are using the affected port
- Bring down the affected port

The following procedure explains how to delete a resource partition.

Step 1 Establish a configuration session using a user name with CISCO_GP privileges.

Step 2 To display a list showing the partitions for this card, enter the **dspparts** command.

Step 3 Note the interface number and partition number for the resource partition you want to delete.

Step 4 To display the active connections, enter the following command:

```
mgx8830a.1.PXM.a > dspcons
```

The following is a sample **dspcons** display.

```
mgx8830a.1.PXM.a > dspcons

Local Port   Vpi.Vci    Remote Port  Vpi.Vci     State     Owner  Pri Persistency
----------------------+----------------------+---------+-------+---+-----------
3:1.1:1      102 102    Routed       102 102     FAIL      MASTER 3   Persistent
Local  Addr: 47.00918100000100001a531c2a.000001031801.00
Remote Addr: 47.00918100000200036b5e30cd.000001011802.00
Preferred Route ID:-
Currently on preferred route: N/A
```

Step 5 Review the **dspcons** command display to see if the interface to which the partition is assigned is being used by a connection.

The Identifier column identifies the interface, VPI, and VCI for the connection in the format: *if.VPI.VCI*. If the interface is in use, note the VPI and VCI values of all connections that use the interface. You will need these to delete the connections.

Step 6 Delete each connection that uses the interface by entering the following command:

```
mgx8830a.1.PXM.a > delcon <ifNum> <VPI> <VCI>
```

Step 7 Bring down the interface by entering the following command:

```
mgx8830a.1.PXM.a > dnport <ifNum>
```

Step 8 Delete the resource partition by entering the following command:

```
mgx8830a.1.PXM.a > delpart <ifNum> <partId>
```

Replace *ifnum* with the interface number of the port, and replace *partitionID* with the partition number assigned to the port.

Step 9 To verify that the partition is deleted, enter the **dspparts** command to display a list of partitions for the card.

Removing Static ATM Addresses

If you create a static ATM address and later want to remove that address, use the following procedure to delete it.

Step 1 Establish a configuration session using a user name with GROUP1 privileges or higher.

Step 2 To locate the port for which you want to delete an address, enter the **dsppnports** command.

Step 3 Enter the following command to delete the static address:

```
mgx8830a.1.PXM.a > deladdr <portid> <atm-address> <length> [-plan {e164|nsap}]
```

The command parameters are described in Table 9-24.

Table 9-24 ATM Address Configuration Parameters

Parameter	Description
portid	Port identifier in the format slot:bay.line:ifnum. These parameters are described in Table 9-1.
atm-address	Enter the ATM address using up to 40 nibbles. The ATM address can include up to 20 bytes, which is 40 nibbles or 160 bits.
length	Enter the length, in bits, of the address you specified with the <*atm-address*> parameter. Each nibble is equal to 4 bits. The acceptable range for the parameter is from 0 to 160 bits.
-plan	Enter the address plan, which is either **e164** (E.164) or **nsap** (NSAP). For an NSAP address, the first byte of the address automatically implies one of the three NSAP address plans: NSAP E.164, NSAP DCC, or NSAP ICD. Default = **nsap**.

Step 4 To verify that the static address is deleted, enter the following command:

```
mgx8830a.1.PXM.a > dspatmaddr <portid>
```

Replace <*portid*> with the port address using the format *slot*:*bay.line*:*ifnum* These parameters are described in Table 9-1.

Configuring VPI and VCI Ranges for SVCs and SPVCs

When you add a partition to a port, you define the minimum and maximum VPIs and VCIs for that port. These VPIs and VCIs become available for all services unless you make additional configuration changes. If this configuration is acceptable for your installation, you can skip this section. You are not required to configure VPI and VCI ranges for SVCs and SPVCs.

The Cisco MGX switches allow you to define the minimum and maximum values for the following parameters:

- SVCC VPIs
- SVCC VCIs
- SPVC VPIs

To configure VPI and VCI usage for connections on a specific port, use the following procedure.

Step 1 Establish a configuration session using a user name with GROUP1 privileges or higher.

Step 2 To display a list of PNNI ports, enter the **dsppnports** command.

Step 3 Enter the following command to bring down the PNNI port you want to configure:

```
mgx8830a.1.PXM.a > dnpnport <portid>
```

A PNNI port is automatically brought up when you add it. You must bring down the port before you can change the port range. Replace <*portid*> using the format slot:bay.line:ifNum. Table 9-1 describes these parameters.

Step 4 Enter configure the port range, enter the following command:

```
mgx8830a.1.PXM.a > cnfpnportrange <portid> [-minsvccvpi <min-svcc-vpi>] [-maxsvccvpi <max-svcc-vpi>]] [-minsvccvci <min-svcc-vci>] [-maxsvccvci <max-svcc-vci>]] [-minsvpcvpi <min-svpc-vpi>] [-maxsvpcvpi <max-svpc-vpi>]]
```

The only required parameter for this command is the <*portid*> parameter, but the command serves no purpose if you enter it without options. If you include some options with the command and omit others, the omitted options remain set to the last configured values. Table 9-25 lists and describes the options and parameters for this command.

Table 9-25 Parameters for the cnfpnportrange Command

Parameter	Description
portid	Port identifier in the format slot:bay.line:ifnum. Table 9-1 describes these parameters.
min-svcc-vpi	Minimum VPI value for SVCC. Range: 0 to 4095. Default = **0**.
max-svcc-vpi	Maximum VPI value for SVCC. Range: 0 to 4095. Default = **4095**.
min-svcc-vci	Minimum VCI value for SVCC. Range: 32 to 65535. Default = **35**.
max-svcc-vci	Maximum VCI value for SVCC. Range: 32 to 65535. Default = **65535**.
min-svpc-vpi	Minimum VPI value for SVPC. Range: 1 to 4095. Default = **1**.
max-svpc-vpi	Maximum VPI value for SVPC. Range: 1 to 4095. Default = **4095**.

Step 5 Enter the following command to bring up the PNNI port you just configured:

```
mgx8830a.1.PXM.a > uppnport <portid>
```

Replace <*portid*> using the format slot:bay.line:ifNum. Table 9-1 describes these parameters.

Step 6 To display the PNNI port range for a port, enter the following command:

```
mgx8830a.1.PXM.a > dsppnportrange <portid>
```

After you enter this command, the switch displays a report similar to the following example:

```
mgx8830a.1.PXM.a > dsppnportrange 1:2.1:2

minSvccVpi:         0            maxSvccVpi:      4095
minSvccVci:        35            maxSvccVci:     65535
minSvpcVpi:         1            maxSvpcVpi:      4095
```

Managing Path and Connection Traces

Cisco MGX switches support the following traces:

- path traces — the trace occurs only during call setup. Therefore, tracing is enabled before call set up then actually occurs while PNNI routes the connection. The applicable connections are SPVCs, SPVPs, SVCs, or SVPs.
- connection traces — the trace occurs for a call that has already been routed. You can trace the route of existing SPVCs and SVCs.

For more information about enabling path and connection traces, refer to the *Cisco MGX 8850 (PXM45/PXM1E), Cisco MGX 8950, Cisco MGX 8830, and Cisco MGX 8880 Command Reference, Release 5*.

Displaying Path and Connection Traces

There are several commands that allow you to display trace information about a connection. By entering these commands at the slave end of the connection, you can determine the path taken by a connection. Table 9-26 describes these commands:

Table 9-26 Path and Connection Trace Commands

Command	Description
dsppathtracenode *<enable|disable>*	Displays the nodal configuration for the path and connection trace.
dsppathtraceport *<portid>*	Displays the port configuration for the path and connection trace.
dsppathtraceie *<portid>*	Displays whether or not TTL 1E is included in the specified port's configuration.
dsppathtracebuffer *<portid><vpi><vci>*	Displays a specific connection based on the physical port's id, vpi, and vci.
dsppathtracebuffer	Displays all path traces in all the path trace buffers.
conntrace	Displays all path traces in all the path trace buffers.

Clearing a Call at the Destination Node

When a call setup message reaches its destination, you can ensure that the call is cleared by entering the **pathtraceport** command as follows:

```
mgx8830a.1.PXM.a > pathtraceport <portid> -X
```

Replace *portid* using the format *slot*:*bay.line*:*ifNum*. Table 9-1 describes these parameters. The -X parameter ensures that calls will be cleared once they reach the destination specified in the *portid* parameter.

Managing Load Sharing

When redundant PXM cards are used, load sharing enables traffic routing through the switch fabric on both PXM cards, doubling the capacity of the switch. Load sharing is enabled by default and should only be disabled for testing or debugging purposes.

The switch provides two options for load sharing management: Auto Shutdown and Plane Alarm Threshold. The switch fabric on each PXM is made up of 3 switch planes that each contain links to 14 slots within the switch chassis. When the Auto Shutdown feature is enabled and one of these internal links fails, that link is automatically shut down, and the card in the affected slot must use a link to another switch plane. If Auto Shutdown is not enabled and a link goes bad, the affected card slot can still attempt to use that link.

The Plane Alarm Threshold option defines the threshold at which a switch plane is declared bad and reported as such. When a switch plane is reported as bad, the PXM on which the switch plane resides should be replaced.

The following procedures describe how to view the load sharing option settings and how to change them.

Displaying Load Sharing Status

Enter the **dspxbarmgmt** command to display the status of the load sharing options. The following example shows the display for this command.

```
mgx8830a.1.PXM.a > dspxbarmgmt
pop20two                        System Rev: 02.01   Dec. 07, 2000 18:36:47 GMT
MGX8850                                             Node Alarm: MAJOR
Load Sharing: Enable
Auto Shutdown: Disable
Plane Alarm Threshold: 3
```

The Load Sharing and Auto Shutdown lines fields show the option status as Enable or Disable. The Plane Alarm Threshold line displays a number from 1 to 32. On PXM cards, the maximum number of slots to which each plane can connect is 14.

Changing Load Sharing Options

To change the load sharing options, enter the **cnfxbarmgmt** command as described in the following procedure.

Step 1 Establish a configuration session using a user name with SUPER_GP privileges or higher.

Step 2 Display the current configuration setting by entering the **dspxbarmgmt** command.

Step 3 Set the load sharing options by entering the **cnfxbarmgmt** command as follows:

```
mgx8830a.1.PXM.a > cnfxbarmgmt <loadSharing> <autoShutdown> <planeAlarmThresh>
```

Note You must enter values for all command parameters, even if you want to change only one of them.

Table 9-27 describes the parameters for this command.

Table 9-27 Command Parameters for cnfxbarmgmt

Parameter	Description
loadSharing	Enables or disables load sharing. Enter **-1**, **0**, or **1**. These values control load sharing as follows: • **-1** unconditionally disables load sharing, regardless of switch plane status • **0** disables load sharing only when there are no switch plane alarms • **1** enables load sharing If you do not want to change the setting, enter the value that corresponds to the current setting displayed with the **dspxbarmgmt** command.
autoShutdown	Enables or disables the Auto Shutdown feature. Enter **0** to disable this feature, or enter **1** to automatically shut down a failed link between a switch plane and a card slot. If you do not want to change the setting, enter the value that corresponds to the current setting displayed with the **dspxbarmgmt** command.
planeAlarmThresh	Defines when a switch plane should be reported as bad. Set the threshold to the number of failed links (between a switch plane and the card slots it services) that exceeds your acceptable limit. The default threshold is **3**. The PXM card supports up to 14 links. If you do not want to change the setting, enter the value that appears when you enter the **dspxbarmgmt** command.

Step 4 To verify your configuration change, enter the **dspxbarmgmt** command.

Managing Telnet Access Features

The Cisco MGX switches include Telnet client and server software. The Telnet server software allows you to establish CLI management sessions with a switch using a Telnet client. The Telnet client software allows you to log into a switch and then establish a Telnet session with another switch.

Starting with Release 5, you can disable the Telnet feature to force users to use secure sessions to access the switch. The following sections describe how to start Telnet sessions from workstations and switches and how to enable or disable Telnet access.

Tip For instructions on establishing secure CLI management sessions from a workstation, see "Starting a Secure (SSH) CLI Session" in Appendix C, "Supporting and Using Additional CLI Access Options." For instructions on establishing secure CLI management sessions between switches, see "Starting and Managing Secure (SSH) Access Sessions Between Switches," which appears later in this chapter.

Starting a Telnet Session from a Workstation

For instructions on starting a Telnet session from a workstation, see "Starting a CLI Telnet Session" in Appendix C, "Supporting and Using Additional CLI Access Options."

Starting and Managing Telnet Sessions Between Switches

The Cisco MGX switches support Telnet sessions between switches. For example, you can start a CLI session with one switch, Telnet to a second switch to view configuration information, then switch back to the first switch and continue that CLI session. Each switch supports up to 15 simultaneous Telnet sessions, and you can Telnet across multiple switches. For example, you can establish a CLI session on switch A, Telnet to switch B, and then Telnet from switch B to switch C. The following sections describe:

- Starting a Telnet Session
- Returning to a Previous Session
- Returning to the Original CLI Session
- Displaying a Telnet Trace

Starting a Telnet Session

To start a Telnet session, enter the **telnet** command as follows:

```
mgx8830a.1.PXM.a > telnet [-E<escapeCharacter>] [-R<tracerouteCharacter>] <ipAddress>
[[0x|X|x]<tcpPort>]
```

You must enter an IP address with the **telnet** command as shown in the following example:

```
mgx8830a.1.PXM.a > telnet 172.29.52.88
Trying 172.29.52.88...
Connected to 172.29.52.88

Login: cisco
password:
```

The -E option allows you to specify an escape character that takes you back to the previous session. For example, if you have Telnetted from Switch A to Switch B to Switch C, you can use this escape character to return to Switch B. The default escape character is Q. To change this, specify an alternate escape character with the -E option when you start a Telnet session. There should be no space character between the -E and the escape character.

The -R option allows you to specify an escape character that displays a trace of your Telnet activity. For example, if you have Telnetted from Switch A to Switch B to Switch C, you can use this escape character to display the Telnet routes from A to B and from B to C. The default escape character is **g**. To change the default escape character, specify an alternate escape character withe the -R option when you start a Telnet session. There should be no space character between the -R and the escape character.

The tcpPort option allows you to specify a destination port for the Telnet session. If you omit this option, the Telnet session uses the default Telnet port.

Returning to a Previous Session

After you Telnet from one switch to another, enter the **bye** command or the **exit** command to close the current session and return to the previous session. For example, if you telnet from Switch A to Switch B to Switch C, the **bye** command will terminate the session on Switch C and display the session on Switch B.

Returning to the Original CLI Session

After you Telnet from switch to switch, enter the escape character to close all Telnet sessions and return to the original CLI session. The default escape sequence is **Escape, Q** (uppercase Q). Press **Escape** first, then press **Shift-Q**. If you specified an alternate escape character when opening Telnet sessions, enter that character in place of Q.

For example, if you Telnet from Switch A to Switch B to Switch C, the escape character sequence closes the Telnet sessions on Switches B and C, and displays the CLI session on Switch A.

Displaying a Telnet Trace

After you Telnet from switch to switch, enter the trace escape character to display a list of connections you have established between switches. The default escape sequence is **Escape, g** (lowercase g). Press **Escape** first, then press **g**. If you specified an alternate escape character when opening Telnet sessions, enter that character in place of g.

The following example shows a sequence of Telnet sessions and the trace that documents the sequence:

```
mgx8830a.1.PXM.a > telnet 172.29.52.88
Trying 172.29.52.88...
Connected to 172.29.52.88

Login: cisco
password:

mgx8830b.1.PXM.a > telnet 172.29.52.56
Trying 172.29.52.56...

Connected to 172.29.52.56

Login:
password:

mgx8830a.1.PXM.a >
-> local IP 172.29.52.56, next hop at 172.29.52.88

-> local IP 172.29.52.88, connected to server at 172.29.52.56

mgx8830b.1.PXM.a >
```

Enabling and Disabling Telnet Access

The Cisco MGX switches include a Telnet server that enables easy, insecure access from Telnet client software running on a workstation or on another Cisco MGX switch. When using Telnet to access a switch, all user ID, password, and session management information is transferred between the client and the switch using clear text. Clear, or unencrypted text can be read by network analysis and snooping tools.

If you are using SSH client software to access Cisco MGX switches, consider disabling Telnet client access so that the switch accepts only secure sessions. To disable Telnet client access, enter the **cnfndparms** command, select option number for *Telnet Access To Node Disabled*, and confirm the action (**Y**) as shown in the following example:

```
PXM1E_SJ.7.PXM.a > cnfndparms
PXM1E_SJ                         System Rev: 04.09   May. 08, 2000 22:50:01 GMT
MGX8850                                              Node Alarm: NONE
NODE CONFIGURATION OPTIONS
Opt#  Value       Type           Description
----  -----       ----           -----------
1     3600        16bit Decimal  SHM Card Reset Sliding Window (secs)
2     3           8bit Decimal   SHM Max Card Resets Per Window (0 = infinite)
3     Yes         Boolean        Core Redundancy Enabled
4     0x0         8bit Hex       Required Power Supply Module Bitmap
5     0x0         8bit Hex       Required Fan Tray Unit Bitmap
6     0           8bit Decimal   Trap Manager Aging timeout value(Hour(s))
7     atm0        8bit Decimal   Primary IP interface for Netmgmt
8     lnPci0      8bit Decimal   Secondary IP interface for Netmgmt
9     Yes         Boolean        Auto Setting of Cellbus Clock Rate Enabled
10    Yes         Boolean        Inband Node-to-Node IP Connectivity Enabled
11    0           8bit Decimal   0 No Gang, 1 Left, 2 Right, 3 Both Present
12    0           8bit Decimal   Card Switchover on Backcard FRU mismatch
13    No          Boolean        Card-to-Card High Priority LCN Disabled
14    No          Boolean        Telnet Access To Node Disabled

Enter option number (1-14): 14
NODE CONFIGURATION OPTIONS
Opt#  Value       Type           Description
----  -----       ----           -----------
14    No          Boolean        Telnet Access To Node Disabled
Enable/Disable telnet access to this node.  If option set to:
    Yes:   Telnet access to this node is disabled.  This
           forces all incoming telnet connections to be rejected by
           the node's telnet server.  Use of another protocol such as SSH
           is needed to remotely log into a terminal session on the node.
    No:    Telnet access to this node is enabled.  This is the default.
           Incoming telnet connections will be accepted by the node's
           telnet server.  Use of other protocols such as SSH are still
           supported for remotely logging into a terminal session on the
           node.

Enter value for option 14 (Y/N): y
NODE CONFIGURATION OPTIONS
Opt#  Value       Type           Description
----  -----       ----           -----------
14    Yes         Boolean        Telnet Access To Node Disabled
```

To test whether Telnet access is disabled, try to establish a session with the switch. In the following example, a Telnet client attempts to connect to a switch on which Telnet access is disabled:

```
Err: access denied


<Your 'TELNET' connection has terminated>
```

In the next example, a Telnet client on one switch attempts to connect to a switch on which Telnet access is disabled:

```
PXM1E_SJ.7.PXM.a > telnet 172.29.52.56
Trying 172.29.52.56...
Connected to 172.29.52.56.
Escape character is ^]
Err: access denied
Connection closed by foreign host.
```

To display the configuration for Telnet client access, enter the **dspndparms** command as described in the next section.

Displaying the Telnet Enable Status

To display the status of Telnet client access, enter the **dspndparms** command and look at row 14. In the following example, Telnet client access is not disabled:

```
PXM1E_SJ.7.PXM.a > dspndparms
PXM1E_SJ                         System Rev: 04.09   May. 08, 2000 22:49:01 GMT
MGX8850                                              Node Alarm: NONE
NODE CONFIGURATION OPTIONS
Opt#  Value       Type           Description
----  -----       ----           -----------
1     3600        16bit Decimal  SHM Card Reset Sliding Window (secs)
2     3           8bit Decimal   SHM Max Card Resets Per Window (0 = infinite)
3     Yes         Boolean        Core Redundancy Enabled
4     0x0         8bit Hex       Required Power Supply Module Bitmap
5     0x0         8bit Hex       Required Fan Tray Unit Bitmap
6     0           8bit Decimal   Trap Manager Aging timeout value(Hour(s))
7     atm0        8bit Decimal   Primary IP interface for Netmgmt
8     lnPci0      8bit Decimal   Secondary IP interface for Netmgmt
9     Yes         Boolean        Auto Setting of Cellbus Clock Rate Enabled
10    Yes         Boolean        Inband Node-to-Node IP Connectivity Enabled
11    0           8bit Decimal   0 No Gang, 1 Left, 2 Right, 3 Both Present
12    0           8bit Decimal   Card Switchover on Backcard FRU mismatch
13    No          Boolean        Card-to-Card High Priority LCN Disabled
14    No          Boolean        Telnet Access To Node Disabled
```

Starting and Managing Secure (SSH) Access Sessions Between Switches

Starting with Release 5, Cisco MGX switches support secure sessions between switches. For example, you can start a CLI session with one switch, then establish a secure session with another switch, and later terminate the second session and return to the first. The following sections describe:

- Starting a Secure Session Between Switches
- Returning to the Previous Session

Tip For instructions on establishing a secure session between a workstation and a switch, see "Starting a Secure (SSH) CLI Session" in Appendix C, "Supporting and Using Additional CLI Access Options." The section on establishing secure sessions from a workstation contains additional information on the secure session feature.

Starting a Secure Session Between Switches

To start a secure session, enter the **ssh** command as follows:

```
mgx8830a.1.PXM.a > ssh [-l username] [-v] [-V] [-q] [-e] [-p] [-1] [-2] [username@]host
[command]
```

Table 9-28 describes the parameters for this command.

Table 9-28 Command Parameters for ssh

Parameter	Description
-l *username*	Specifies a username for login on the remote host. If no username is specified, the client switch where you enter this command uses your current login name. Example: PXM1E_SJ.7.PXM.a > **ssh** -l superuser 172.29.52.56 superuser@172.29.52.56's password: M8850_NY.7.PXM.a >
-v	The verbose (lowercase v) option displays status messages regarding the establishment of the secure connection. You can enter the **-v** option up to three times to increase the level of message reporting. One **-v** provides the least detail and **-v -v -v** provides the most detail.
-V	The version option (upper case V) displays the SSH version information only as shown in the following example: PXM1E_SJ.7.PXM.a > **ssh** -V 172.29.52.88 SSHield_1.6.1 derived from OpenSSH_3.0.2p1, SSH protocols 1.5/2.0, OpenSSL 0x0090602f **Note** The -V option takes precedence over other command options. For example, a remote switch IP address is specified in the above example. In this example, the switch displays only the version information and does not establish a secure session with the remote switch.
-q	The quiet option suppresses warning messages.
-e	The escape option defines an escape character for the session. To specify no escape character, enter "none." The default escape character is the tilde symbol (~).
-p	The port option specifies the port to connect to at the remote server. The default value for the client and the server is 22. If you change the port number at the remote switch, you must specify the correct port number when entering the **ssh** command.
-1	The -1 option forces the secure session to use the SSH Version 1 protocol.
-2	The -2 option forces the secure session to use the SSH Version 2 protocol.
username@	Specifies a username for login on the remote host. If no username is specified, the client switch where you enter this command uses your current login name. Example: PXM1E_SJ.7.PXM.a > **ssh** superuser@172.29.52.56 superuser@172.29.52.56's password:

Table 9-28 Command Parameters for ssh (continued)

Parameter	Description
host	Replace **host** with the IP address of the remote switch. If a remote switch name is associated with an IP address in the local hosts file, you can enter a name instead of the IP address. **Note** If your IP configuration supports it, you can establish a secure session with the active or the standby PXM. For more information, see "Guidelines for Creating an IP Address Plan" in Chapter 1, "Preparing for Configuration."
command	The command option specifies a command to be executed on a remote host. **Note** This feature is not supported on remote Cisco MGX nodes.

You must enter an IP address or host name with the **ssh** command as shown in the following example:

```
M8850_NY.7.PXM.a > ssh 172.29.52.88
cisco@172.29.52.88's password:


M8850_LA.8.PXM.a >
```

Note When establishing secure sessions between switches, you can establish only one additional session beyond the original. For example, you can establish a CLI management session from a workstation to switch B, and then establish a secure session from switch B to switch C. However, you cannot extend the secure session from switch C to another device.

The following example shows what happens the first time a secure session is established between two switches:

```
PXM1E_SJ.7.PXM.a > ssh 172.29.52.89
The authenticity of host '172.29.52.89 (172.29.52.89)' can't be established.
DSA key fingerprint is 21:a0:7e:f2:64:b5:0c:71:ac:95:05:0b:42:11:4c:94.
Are you sure you want to continue connecting (yes/no)? yes

Warning: Permanently added '172.29.52.89' (DSA) to the list of known hosts.
cisco@172.29.52.89's password:


M8950_SF.8.PXM.a >
```

In the example above, the remote host is not known to the local host. After you type **yes** (the word yes must be spelled out), the remote host is added to the list of known hosts and the next login requires only a password:

```
PXM1E_SJ.7.PXM.a > ssh 172.29.52.88
cisco@172.29.52.88's password:


M8850_LA.8.PXM
```

Returning to the Previous Session

After you create a secure session between two switches, enter the **bye** command or the **exit** command to close the current session and return to the previous session. The following example shows the switch response to the bye command:

```
M8850_LA.8.PXM.a > bye

(session ended)

Connection to 172.29.52.88 closed by remote host.
Connection to 172.29.52.88 closed.

M8850_NY.7.PXM.a >
```

Managing Remote (TACACS+) Authentication and Authorization

Remote authentication and authorization is a feature that allows you to manage user authentication and command authorization on multiple switches from a single authentication, authorization, and accounting (AAA) server. Authentication verifies that a user is entitled to connect to a switch, and authorization verifies that the user is entitled to execute each command the user enters. Communications between the switch and the AAA server use the Terminal Access Control Access Control System Plus (TACACS+) protocol. To configure remote authentication and authorization, you need to do the following:

1. Configure AAA servers
2. Configure the Cisco MGX switch to access the AAA servers
3. Configure the default privilege level
4. Configure the prompt override option
5. Configure authentication on the switch
6. Configure authorization on the switch

The following sections describe how to perform these tasks and other tasks related to managing AAA server authentication.

Configuring AAA Servers

To configure a Cisco MGX switch for remote TACACS+ authentication and authorization, you must have an IP address for the remote AAA server. For encrypted authentication and authorization, you must also have an encrypted key to apply at the AAA server and at the Cisco MGX switch.

Tip If you know the encryption key and the IP address the AAA server will use, you can configure the server after the switch. The "Configuring User Authentication on the Switch" and "Configuring Command Authorization on the Switch" sections describe the authentication and authorization that take place when the AAA server is not available.

The exact procedure for configuring the AAA server can be found in the documentation for that product. The following is a list of the general tasks that need to be performed:

- Install the AAA server.
- Configure the AAA server to use the TACACS+ protocol.
- Configure the AAA server IP address and provide it to the person that configures the Cisco MGX switch.
- If encrypted authentication and authorization is planned, produce an encryption key and give it to the person that configures the Cisco MGX switch.
- If required by the AAA server, configure the AAA server to use the IP address of each Cisco MGX switch it will support. (Some AAA servers accept communications from any IP address if the encryption key is correct.)
- Configure the AAA server to support the *cisco* user at the CISCO_GP level. We recommend that you also configure users at the SERVICE_GP and SUPER_GP levels.
- Configure the AAA server to support additional users according to the requirements of your business.

Configuring the Cisco MGX Switch to Access AAA Servers

The first step in configuring a Cisco MGX Switch for AAA server access is to configure the identity of one or more AAA servers on the switch. The switch will not permit you to select TACACS+ authentication or authorization until at least one AAA server has been configured. To configure a Cisco MGX switch for remote TACACS+ authentication and authorization, you must have an IP address for the remote AAA server. For encrypted authentication and authorization, you must also configure an encryption key at the switch and at the AAA server.

Tip If you know the encryption key and the IP address the AAA server will use, you can configure the server after the switch. The "Configuring User Authentication on the Switch" and "Configuring Command Authorization on the Switch" sections describe the authentication and authorization that take place when the AAA server is not available.

To configure an AAA server, log in using a username with SERVICE_GP privileges or higher and enter the **cnfaaa-server** command in the following format:

```
M8850_LA.7.PXM.a >  cnfaaa-server tacacs+ -ip <ServerIp> [-port <ServerPort>] [-primary]
                    [-timeout <timeout>] [-dt <dt>] [-single <single>]
```

Table 9-29 describes the parameters for this command.

Table 9-29 Parameters for cnfaaa-server *Command*

Parameter	Description
ServerIp	This required parameter identifies the IP address of a target AAA server.
ServerPort	When the target AAA server does not use the default port number for TACACS+ communications, you can use this optional parameter to specify the correct port. The default port number is 49.
-primary	When multiple AAA servers are configured, use this optional parameter to specify the primary or preferred server to use for authentication and authorization. There can be up to three servers.

Table 9-29 Parameters for cnfaaa-server *Command (continued)*

Parameter	Description
timeout	The optional timeout parameter specifies how long the switch will wait for an authentication or authorization response from a server. If no response is received by the end of the timeout period, the server is marked *dead* and the switch does not try to access that server again until the end of the *dead time* period, which is describe below. When a server is marked dead, the switch tries to access the next server in the configured list. If no AAA servers respond, the switch uses the next configured method as described in the "Configuring User Authentication on the Switch" and "Configuring Command Authorization on the Switch" sections. You can specify the time out by entering a number in the range of 1 to 30 seconds, or by entering the **default** keyword. The default timeout value is 5 seconds.
dt	This optional parameter defines the dead time for a configured server. The dead time starts when a server fails to respond. During the dead time, the switch will not attempt to use the unresponsive server. Instead, the switch will use other configured servers, and if all servers are unresponsive, the switch uses other authentication and authorization methods as described in the "Configuring User Authentication on the Switch" and "Configuring Command Authorization on the Switch" sections. You can specify the dead time out by entering a number in the range of 0 to 5 minutes, or by entering the **default** keyword. The default dead time value is 0 minutes.
single	This optional parameter selects either single-connection server communications or multiple-connection server communications. If single-connection communications are selected, the switch attempts to direct all authentication and authorization requests through a single TCP connection to the server. If single-connection communications are disabled, multiple TCP connections are used for multiple authentication and authorization requests. **Note** When this feature is disabled (multiple-connection communications is enabled) and you are running one or more scripts, we recommend executing commands no less than .6 seconds apart for each script. For example, if two scripts are running at the same time, commands should be executed not less than 1.2 seconds apart. If commands are issued more frequently than this, the following symptoms can appear: • Telnet sessions take a long time to start. • FTP sessions can fail. • The following message can appear: *Command execution currently restricted to root users only.* • The warning *W_THROTTLED* is logged once every 30 minutes while this occurs. • In the **dspaaa-stats** command display, the *# socket throttles* row values will increment. Valid settings for this parameter are **true**, **false**, and **default**, which produces the same result as selecting **true**. The default configuration for single-connection communications is **true**.

After you enter the **cnfaaa-server** command, the switch prompts you to enter a encryption key. The encryption key is a text string that can contain any combination of letters, numbers, spaces, and characters. This key is required for encrypted communications with the server and must also be entered at the AAA server. To enter an encryption key, respond to the prompts as shown in the following example:

```
M8830_SF.2.PXM.a > cnfaaa-server tacacs+ -ip 172.29.52.112
Do you want to change the encryption key (yes/no)?y
Enter the encryption key:
Re-enter the encryption key:

TACACS+ SERVERS:    primary is shown first

                        Time Dead  Single
   IP Address      Port  Out  Time  Conn   Shared Encryption Key
----------------  ----  ---  ----  ------ --------------------------------------
172.29.52.111      49    5    0     true
172.29.52.112      49    5    0     true   12345abcde

WARNING: One or more TACACS+ servers do not have a key configured.
Information exchanged with this server will be unencrypted, in clear text.
```

The encryption key must be entered twice and should be entered without quotation marks, unless the quotation marks themselves are part of the key. Although white spaces are allowed inside the key, white spaces are not allowed at the beginning or end of the key; they are automatically stripped off.

Note For maximum security, Cisco recommends that you use an encryption key for TACACS+ communications. The encryption key is used to encrypt communications so that user names and passwords are not easily acquired by unauthorized users. Some AAA servers may require an encryption key. If the AAA server requires an encryption key, the same key must be configured at the server and at the Cisco MGX switch.

A configuration without a key is recommended only for troubleshooting or lab testing. When no encryption key is specified, all communications are in clear text format and are easier to read by unauthorized users.

If you are not using encryption, just respond to the prompts as shown in the following example:

```
M8830_SF.2.PXM.a > cnfaaa-server tacacs+ -ip 172.29.52.111
Do you want to change the encryption key (yes/no)?n

WARNING: No encrpytion key specified for the TACACS+ protocol. This means
that all information shared with the server will be in cleartext! This is
a security risk.
Do you want to proceed (Yes/No)? y

TACACS+ SERVERS:    primary is shown first

                        Time Dead  Single
   IP Address      Port  Out  Time  Conn   Shared Encryption Key
----------------  ----  ---  ----  ------ --------------------------------------
172.29.52.111      49    5    0     true

WARNING: One or more TACACS+ servers do not have a key configured.
Information exchanged with this server will be unencrypted, in clear text.
```

Configuring the Default Privilege Level

The default privilege level applies when the AAA server authenticates a user and no privilege level has been configured for or is available for that user. To set the default privilege level, enter the **cnfaaa-priv** command using the following format:

```
M8850_LA.7.PXM.a > cnfaaa-priv
<CISCO_GP|SERVICE_GP|SUPER_GP|GROUP1|ANYUSER|NOUSER_GP|default>
```

With two exceptions, the available privilege levels are the same as those described in the "Configuring User Access" section of Chapter 2, "Configuring General Switch Features." The exceptions are the NOUSER_GP and default privilege levels, which deny access to all commands. The default value assigned to the default privilege level is NOUSER_GP.

Note When the default privilege level is set to **NOUSER_GP** or **default**, user access to the switch is blocked because the user is not allowed to execute any commands.

Configuring the Prompt Override Option

The prompt override option allows you to choose the prompt used during authentication. The switch prompt is the prompt that the switch displays when an AAA server is not in use. You can override this selection with an access control server (ACS) prompt supplied by the AAA server. If you choose the AAA server prompt and the server does not provide a prompt, the switch prompt appears.

The default prompt configuration selects the switch prompt. To change the prompt section, enter the **cnfaaa-prompt** command as follows:

```
M8850_LA.7.PXM.a >  cnfaaa-prompt <switch | acs | default>
```

The **default** parameter produces the same result as choosing **acs**, which selects the AAA server prompt. Specify **switch** to select the switch prompt.

Caution If your installation uses scripts that expect the switch prompt, using the AAA server prompt can make those scripts inoperable.

Configuring User Authentication on the Switch

Cisco MGX Release 5 switches support three different authentication methods for user access. These methods are described next to the keywords that select them in Table 9-30.

Table 9-30 Keywords for cnfaaa_authen and cnfaaa-author Commands

Keyword	Description
cisco	The **cisco** keyword selects the local database for authentication or authorization and limits access only to the user *cisco*. **Note** User *cisco* access method is always enabled and is used for authentication and authorization when all other methods fail. However, you can configure the user *cisco* access method to have a higher priority than other authentication or authorization methods.
default	The **default** keyword selects the local (on the switch) database for authentication or authorization. This keyword produces the same result as the **local** keyword. When this method is chosen for authorization (which is described in the next section), it is only valid for group mode.
local	The **local** keyword selects the local database for authentication or authorization. When this method is chosen for authorization, it is only valid for group mode.
tacacs+	The **tacacs+** keyword selects authentication or authorization through TACACS+ protocol communications with an AAA server.

You can select multiple authentication methods. When a user attempts to authenticate, the switch uses the authenticated methods in the configured order. If the first method attempted fails to get a pass or fail for the user, the next method is attempted. For example, if the configured methods are “tacacs+ local” and no TACACS+ servers are available, the switch will use the local database to authenticate users.

When TACACS+ is used for authentication, it is not very practical to use the local database for a backup. A prime advantage of the TACACS+ method is that you do not have to configure users in the local database on every switch. When the configuration uses the local database for backup, user data must be entered into the AAA server at every switch in the network, and updates must be manually synchronized on the switch and server. A more practical approach is to establish fault tolerance by setting up multiple AAA servers.

The *cisco* method listed in Table 9-30 is always enabled and is the last authentication method attempted if it is not configured before the *local* or *tacacs+* methods. This ensures that the user *cisco* can access the switch when the AAA servers are unavailable.

To configure authentication, log in using a username with SERVICE_GP privileges or higher and enter the **cnfaaa-authen** command using the following format:

```
M8850_LA.7.PXM.a > cnfaaa-authen <method> [<method>...]
```

Replace the *method* variables with one of the keywords listed in Table 9-30. The first method after the command name is the preferred method. You can enter up to three methods. The second method is used when the first method does not produce a pass or fail, and the third method is used when the second method cannot authenticate the user.

Note If you enter the **cnfaaa-authen** command and specify the *tacacs+* method, and if no AAA servers are configured, the command will fail. Configure AAA servers with the **cnfaaa-server** command before you configure authentication.

The following example configures authentication through the *tacacs+* method:

```
M8830_SF.2.PXM.a > cnfaaa-authen tacacs+
AAA CONFIGURATION:
   Authentication Methods  :  tacacs+ cisco
   Authorization Methods   :  local cisco
   Authorization Type      :  group
   Default Privilege Level :  NOUSER_GP
   Prompt Display          :  acs
   SSH/FTP Message Type    :  Inbound ASCII Login
   IOS Exclusion List      :

WARNING: The newly configured authentication/authorization methods will
apply to new session.  This configuration has no impact on existing sessions.
```

Note that the example above did not configure the *cisco* authentication method, but this method is listed as the backup for the *tacacs+* method in the *Authentication Methods* line. There is no need to enter the *cisco* method when it is the last method to be used.

To return a switch to the default authentication configuration, enter the following command:

```
M8830_SF.2.PXM.a > cnfaaa-authen default
AAA CONFIGURATION:
   Authentication Methods  :  local cisco
   Authorization Methods   :  local cisco
   Authorization Type      :  group
   Default Privilege Level :  NOUSER_GP
   Prompt Display          :  acs
   SSH/FTP Message Type    :  Inbound ASCII Login
   IOS Exclusion List      :

WARNING: The newly configured authentication/authorization methods will
apply to new session.  This configuration has no impact on existing sessions.
```

Notice the text in the command display that reminds you that changes in the authentication method only apply to new sessions. This switch behavior prevents instant lockout if you make a configuration mistake.

Configuring Command Authorization on the Switch

Authorization validates an authenticated user's access to a command each time a command is entered. When the switch uses an AAA server for authorization, the AAA switch can authorize commands in one of the following ways:

- The AAA server sends a switch access privilege level or group ID back to the switch one time for each login session, and the switch validates all session commands based on that group ID. This method is called group mode.
- The AAA server validates every command the user enters using its own internal configuration to determine if the user has access to the command. This method is called command mode.

Group mode requires less configuration at the AAA server, and it consumes less bandwidth during each session. When the switch is configured for command mode, the AAA server must be configured to define the command set available to each user. The advantage to command mode is that you can customize access for each user. You are not limited to the access options defined on the switch.

To configure authorization, log in using a username with SERVICE_GP privileges or higher and enter the **cnfaaa-author** command using the following format:

```
M8850_LA.7.PXM.a >  cnfaaa-author <authorType> <method> [<method>...]
```

Replace the *authorType* variable with **group** to select group mode or with **command** to select command mode. As with the *cnfaaa-authen* command, you can specify up to three methods (see Table 9-30) for authorization, and the switch will use these methods in the configured order. As with authentication, the local method is not a practical substitute for AAA server authorization because it requires data entry in the AAA server and every supported switch.

The following example configures the switch to use group mode for authorization:

```
M8830_SF.2.PXM.a > cnfaaa-author group tacacs+
AAA CONFIGURATION:
   Authentication Methods  :  tacacs+ cisco
   Authorization Methods   : tacacs+ cisco
   Authorization Type      :  group
   Default Privilege Level :  NOUSER_GP
   Prompt Display          :  acs
   SSH/FTP Message Type    :  Inbound ASCII Login
   IOS Exclusion List      :

WARNING: The newly configured authentication/authorization methods will
apply to new session.  This configuration has no impact on existing sessions.
```

Configuring FTP and SSH Messaging Format for AAA Servers

When the switch configuration uses an AAA server for authentication and authorization, FTP and SSH requests are directed to the remote server. The TACACS+ message format for these requests can be either ASCII or PAP.

One special application of the FTP and SSH messaging format applies when the AAA server is configured to issue challenges, which are not supported by FTP and SSH. In this application, the PAP message format should be configured.

To select the messaging format, log in using a username with SERVICE_GP privileges or higher and enter the **cnfaaa-ftpssh** command in the following format:

```
M8850_LA.7.PXM.a >  cnfaaa-ftpssh <ascii|pap|default>
```

Enter the **ascii** keyword to select TACACS+ ASCII login messages. Enter the **pap** keyword to select TACACS+ PAP login messages. The **default** keyword selects TACACS+ ASCII login messages.

The following example selects the PAP message format:

```
M8830_SF.2.PXM.a > cnfaaa-ftpssh pap
AAA CONFIGURATION:
   Authentication Methods  :  tacacs+ cisco
   Authorization Methods   :  local cisco
   Authorization Type      :  group
   Default Privilege Level :  NOUSER_GP
   Prompt Display          :  acs
   SSH/FTP Message Type    :  Inbound PAP Login
   IOS Exclusion List      :
```

Displaying the TACACS+ Configuration

To display the complete authentication and authorization configuration, enter the **dspaaa** command as shown in the following example:

```
M8830_SF.2.PXM.a > dspaaa
AAA CONFIGURATION:
   Authentication Methods  :  tacacs+ cisco
   Authorization Methods   :  local cisco
   Authorization Type      :  group
   Default Privilege Level :  NOUSER_GP
   Prompt Display          :  acs
   SSH/FTP Message Type    :  Inbound PAP Login
   IOS Exclusion List      :

TACACS+ SERVERS:    primary is shown first

                        Time Dead  Single
   IP Address      Port  Out  Time  Conn   Shared Encryption Key
----------------  ----  ---  ----  ------ --------------------------------------
172.29.52.111     49    5    0     true
172.29.52.112     49    5    0     true   12345abcde

WARNING: One or more TACACS+ servers do not have a key configured.
Information exchanged with this server will be unencrypted, in clear text.
```

Displaying AAA Server Information

To display a list of configured AAA servers, enter the **dspaaa-servers** command as shown in the following example:

```
M8830_SF.2.PXM.a > dspaaa-servers

TACACS+ SERVERS:    primary is shown first

                        Time Dead  Single
   IP Address      Port  Out  Time  Conn   Shared Encryption Key
----------------  ----  ---  ----  ------ --------------------------------------
172.29.52.111     49    5    0     true
172.29.52.112     49    5    0     true   12345abcde

WARNING: One or more TACACS+ servers do not have a key configured.
Information exchanged with this server will be unencrypted, in clear text.
```

Displaying AAA Server Statistics

To display a list of AAA server statistics, enter the **dspaaa-stats** command as shown in the following format:

```
M8830_SF.2.PXM.a > dspaaa-stats [clear | detail]
```

If you enter this command without parameters, the switch displays a list of AAA server statistics. If you enter the **detail** parameter, the switch displays additional data that does not appear when this option is omitted. To reset statistics counters to zero, enter this command with the **clear** parameter.

Tip For more information on the **dspaaa-stats** command display, refer to the *Cisco MGX 8850 (PXM45/PXM1E), Cisco MGX 8950, Cisco MGX 8830, and Cisco MGX 8880 Command Reference, Release 5*.

The following example shows what appears when the command is entered without additional parameters:

```
M8830_CH.1.PXM.a > dspaaa-stats

Last cleared on: 04/01/2004 04:46:53  (GMT)

Last good login authen: cisco         telnet.01    10.21.98.207
                        local   local-database
                        04/11/2004 19:48:27  (GMT)
Last bad login authen:  NONE
Last good grp priv:     cisco         telnet.01    10.21.98.207
                        local   local-database
                        04/11/2004 19:48:27  (GMT)
Last bad grp priv:      NONE
Last failed cmd:        NONE

____SWITCH LEVEL COUNTS____
Method:                 cisco             local             TACACS
# authen failures:      0                 0                 0
# grp author failures:  0                 0                 0
# cmd author failures:  0                 -----             0
# authen falls back to: 0                 0                 0
# author falls back to: 0                 0                 0
# authen unreachable:   -----             -----             0
# author unreachable:   -----             -----             0
# challenges RX:        -----             -----             0
# socket throttles:     -----             -----             0
# Messages TX:          -----             -----             0
# Messages RX:          -----             -----             0
# Messages Flushed:     -----             -----             0
# Abort Messages Sent:  -----             -----             0
# Supported AVPs RX:    -----             -----             0
# Unsupported AVPs RX:  -----             -----             0
# Unknown AVPs RX:      -----             -----             0

____TACACS+ SERVER LEVEL COUNTS____
Server IP Address:      0.0.0.0           0.0.0.0           0.0.0.0
Server Port:            0                 0                 0
# authen failures:      0                 0                 0
# cmd author failures:  0                 0                 0
# authen falls back to: 0                 0                 0
# author falls back to: 0                 0                 0
# authen unreachable:   0                 0                 0
# author unreachable:   0                 0                 0
# challenges RX:        0                 0                 0
# Messages TX:          0                 0                 0
# Messages RX:          0                 0                 0
# Messages Flushed:     0                 0                 0
# Abort Messages Sent:  0                 0                 0
# Supported AVPs RX:    0                 0                 0
# Unsupported AVPs RX:  0                 0                 0
# Unknown AVPs RX:      0                 0                 0
Avg Response Delay:     0                 0                 0
Max Response Delay:     0                 0                 0

____Abort Messages TX____
```

```
None

Type <CR> to continue, Q<CR> to stop:

____Server Messages RX____
None
```

Avoiding Command Mode Authorization Issues with RPM

Cisco Route Processor Module (RPM) cards are router cards that can be installed in Cisco MGX switches. The switch has its own operating system and so does each RPM card installed in the switch. When command mode authorization is enabled, RPM login names, passwords, and commands must be authorized by the AAA server and the RPM operating system, which is IOS. If users establish Telnet sessions from an RPM card to a different operating system (such as a UNIX host running CWM), all commands for the additional operating system must be authorized by the AAA server and that operating system.

The switch software provides a special command to prevent redundant authorization and the enormous amount of configuration that would be required to configure the AAA server for multiple operating systems. The **cnfaaa-ignore-ios** command configures the switch to exclude select slots from authentication and authorization when the slots host RPM cards.

To enable or disable switch authentication and authorization for slots that host RPM cards, log in using a username with SERVICE_GP privileges or higher and enter the **cnfaaa-ignore-ios** command in the following format:

```
M8850_LA.7.PXM.a >   cnfaaa-ignore-ios add|del [slot]
```

Enter the **add** keyword to add the selected slot or slots to the list of slots that are ignored for switch authentication and authorization when an RPM card is installed. Enter the **del** keyword to delete the selected slot or slots from the ignored list. If you specify a slot, the command applies to only that slot. If you do not specify a slot, the command applies to all slots in the switch.

The following example configures the switch to ignore switch authentication and authorization for card slot 3 when an RPM card is inserted in that slot:

```
M8830_SF.2.PXM.a > cnfaaa-ignore-ios add 3
AAA CONFIGURATION:
   Authentication Methods  :  tacacs+ cisco
   Authorization Methods   :  local cisco
   Authorization Type      :  group
   Default Privilege Level :  NOUSER_GP
   Prompt Display          :  acs
   SSH/FTP Message Type    :  Inbound PAP Login
   IOS Exclusion List      :  3

WARNING: The newly configured IOS card exclusion list will apply to new session.
This configuration has no impact on existing sessions.
```

Verifying PXM Disk Data

When a failure occurs before a write is complete, the data on the active and standby hard disk may not match.

Enter the **verifydiskdb check** [*-l <level>] [-s <slot>] [-p <pass>*] command at the active PXM to run the disk verification utility. Table 9-31 describes the possible options for the **verifydiskdb check** command.

Note Cisco recommends that you run the disk verification utility during a time when there is minimal activity on the switch.

Table 9-31 describes the possible options for the **verifydiskdb check** command.

Table 9-31 verifydiskdb check Command Parameters

Parameter	Description
slot	Slot number of the card on which you want to run the disk verification task.
level	Level on verification for the current task. The levels of verification are as follows: 1 = control information 2 = actual data Default = 2
application	Number of times the verification utility will pass through the disk if a discrepancy is found. Multiple passes create the opportunity for software to resolve discrepancies. The number of passes rangers from 1 through 10. **Note** If no discrepancies are found, the verification utility runs through the disk only once. Default = 3

If you enter **verifydiskdb check** without any options, the verification utility verifies that the data on the active hard disk matches the data on the standby hard disk. In the following example, the user runs the verification utility for all cards in the node.

```
pop20two.7.PXM.a > verifydiskdb check

pop20two.7.PXM.a >
```

Enter **verifydiskdb check** with the -sl <*slot number*> option to run the verification utility only on the specified slot.

In the following example, the user configures the verification utility to check for any discrepancies in the control information on the card in slot 7. If any discrepancy is found, the verification utility will run through the disk up to 3 times before it finishes.

```
pop20two.7.PXM.a > verifydiskdb check -l 1 -sl 7 -p 3
```

The disk verification task runs in the background until completion. It can take a few seconds or several hours for the disk verification task to finish. The more connections configured on the switch, the longer it takes the utility to complete disk verification. To view the progress of the disk verification task, enter the **verifydiskdb status** command while the verification task is running.

```
pop20two.7.PXM.a > verifydiskdb status


Verification is currently running with the following parameters:
Request: Slot(s): ALL Level: 1   Passes: 3

Current Status
Slot: 7, Databases: 13 Tables 88
DB Index: 12    DB Name: spvcRed
Table Details:
Table Index: 81    Table Name: Disk_spvc_pep_db19
Total Records: 10000   Records Verified: 0
```

Table 9-32 describes the information displayed by the **verifydiskdb status** command.

Table 9-32 verifydiskdb status Command Display

Parameter	Description
Slot	Current slot whose databases on active and standby PXM hard drives are being compared.
Databases:	Number of databases detected for the current slot.
Tables	Total number of tables detected for all databases for the slot.
DB Index:	Index number of the current database being compared.
DB Name:	Name of the database currently being compared.
Table Details:	Details about the current table being compared.
Table Index:	Index number of the current table being compared.
Table Name:	Name of the current table being compared.
Total Records:	Total number of records.
Records Verified:	Number of records verified.
Databases Verified:	Number of databases verified.
Tables Verified:	Number of tables verified.

Note To stop the disk verification task while it is in progress, enter the **verifydiskdb abort** command.

Displaying the Contents of the Disk Verification Utility Log File

When the disk verification task is complete, a log file of the task is stored in the log folder on your hard drive. Each log file contains a header with the slot number and the status of the card.

If more information about the discrepancies is determined, it is stored in the log file. However, there is no comparison between data on the hard disk versus data on the card.

To view the disk verification utility log file, enter the **verifydiskdb display** command as shown in the following example.

```
pop20two.7.PXM.a > verifydiskdb display
```

If you want to view an older log file, enter the **verifydiskdb display** command with the **-l old** option, as shown in the following example.

```
pop20two.7.PXM.a > verifydiskdb display -l old
```

Note The directory only keeps two log files per slot. If disk verification is executed a third time for a slot that contains two log files, the oldest of the two files is removed.

If no discrepancies are found on a card, the log file contains only the slot number, timestamp of the verification task, and a message stating that no discrepancies were found. This is shown in the following example:

```
------------------  Information for Slot  5 ------------------
Start: 22/05/2002-10:31:19    -    End: 22/05/2002-10:31:27

             Verify DONE

 TotalofDbs= 2, TotalofTbls= 15, #DbVerf=2, #TblVerf= 15
             No Discrepancies found for slot 5
--------------------------------------------------------------
```

If discrepancies were found on a card, the log file contains the names of the databases and tables in which the discrepancies were found, as shown in the following example:

```
------------------  Information for Slot  1 ------------------
Start: 20/04/2002-17:43:49    -    End: 20/04/2002-17:43:57

             Verify DONE

 TotalofDbs= 4, TotalofTbls= 20, #DbVerf=4, #TblVerf= 20
=============================================================
dbInd: 2 - dbName: EmDiskDb
tblInd: 17 - tblName: LineTable
Record: 8  ActvChkSum: 0 StdbyChkSum: 549
=============================================================
dbInd: 2 - dbName: EmDiskDb
tblInd: 17 - tblName: LineTable
Record: 9  ActvChkSum: 0 StdbyChkSum: 549
===============================================================

                 Verification Slot Summary
Start: 20/04/2002-17:43:49    -    End: 20/04/2002-17:43:57
Total Discrepancies Found: 2, Total Discrepancies Sync: 0
--------------------------------------------------------------
```

If the verification utility is run on a slot in which no card resides, the display will show that the slot is invalid and has been skipped as shown in the following example:

```
--------------------------------------------------------------
------------------  Information for Slot  2 ------------------
Start: 22/05/2002-10:31:10    -    End: 22/05/2002-10:31:10

           Verify SKIPPED - INV_SLOT

 TotalofDbs= 0, TotalofTbls= 0, #DbVerf=0, #TblVerf= 0
             No Discrepancies found for slot 2
--------------------------------------------------------------
--------------------------------------------------------------
```

If the card is in an unstable state, the display indicates that the verification utility skipped that slot because it is unstable. The following example shows this:

```
------------------  Information for Slot  4 ------------------
Start: 20/04/2002-17:44:06    -    End: 20/04/2002-17:44:06

           Verify SKIPPED - UNSTABLE SLOT

 TotalofDbs= 0, TotalofTbls= 0, #DbVerf=0, #TblVerf= 0
             No Discrepancies found for slot 4
--------------------------------------------------------------
```

If a firmware upgrade did not finish (the **commitrev** command was not issued on the slot), the display indicates that the verification utility skipped that slot because a REV_CHG is in progress. This is shown in the following example:

```
------------------  Information for Slot  6 ------------------
Start: 20/04/2002-17:44:14    -    End: 20/04/2002-17:44:14

           Verify SKIPPED - REV_CHG

 TotalofDbs= 0, TotalofTbls= 0, #DbVerf=0, #TblVerf= 0
             No Discrepancies found for slot 6
--------------------------------------------------------------
```

If more than 20 discrepancies are found in a table or database, the utility terminates and the display indicates that the slot is unstable. The display also lists the names of the tables and databases where the discrepancies were found. The following example shows the display for an unstable slot with more that 20 discrepancies:

```
-----------------  Information for Slot  9 ------------------
Start: 20/04/2002-17:44:54    -    End: 20/04/2002-17:44:57

           Verify SKIPPED - UNSTABLE SLOT

 TotalofDbs= 2, TotalofTbls= 6, #DbVerf=0, #TblVerf= 0
=============================================================
dbInd: 1 - dbName: sm_mib_v21
tblInd: 5 - tblName: mib29
Record: 1782  ActvComdID: 0 StdbyComID: 7
=============================================================
dbInd: 1 - dbName: sm_mib_v21
tblInd: 5 - tblName: mib29
Record: 1783  ActvComdID: 0 StdbyComID: 7
=============================================================
dbInd: 1 - dbName: sm_mib_v21
tblInd: 5 - tblName: mib29
Record: 1784  ActvComdID: 0 StdbyComID: 7
=============================================================
```

```
dbInd: 1 - dbName: sm_mib_v21
tblInd: 5 - tblName: mib29
Record: 1785  ActvComdID: 0 StdbyComID: 7
==============================================================
dbInd: 1 - dbName: sm_mib_v21
tblInd: 5 - tblName: mib29
Record: 1786  ActvComdID: 0 StdbyComID: 7
==============================================================
dbInd: 1 - dbName: sm_mib_v21
tblInd: 5 - tblName: mib29
Record: 1787  ActvComdID: 0 StdbyComID: 7
==============================================================
dbInd: 1 - dbName: sm_mib_v21
tblInd: 5 - tblName: mib29
Record: 1788  ActvComdID: 0 StdbyComID: 7
==============================================================
dbInd: 1 - dbName: sm_mib_v21
tblInd: 5 - tblName: mib29
Record: 1789  ActvComdID: 0 StdbyComID: 7
==============================================================
dbInd: 1 - dbName: sm_mib_v21
tblInd: 5 - tblName: mib29
Record: 1790  ActvComdID: 0 StdbyComID: 7
==============================================================
dbInd: 1 - dbName: sm_mib_v21
tblInd: 5 - tblName: mib29
Record: 1791  ActvComdID: 0 StdbyComID: 7
==============================================================
dbInd: 1 - dbName: sm_mib_v21
tblInd: 5 - tblName: mib29
Record: 1792  ActvComdID: 0 StdbyComID: 7
==============================================================
```

Note The disk verification utility only logs discrepancies. It does not synchronize the differences.

Troubleshooting Active and Standby Card Disk Discrepancies

If discrepancies are found by the disk verification utility, follow these steps:

Step 1 Locate the logs that pertain to the affected database(s) for the indicated slot.

Step 2 If possible, perform application specific task to resync that DB record. For example, remove and re-install, and re-provision the card.

Step 3 If you can not perform application specific tasks on the card, enter the **resetcd** command to reset the standby PXM to re-synchronize the database.

If you provision connections while the **verifydiskdb check** command is running, discrepancies will be flagged, even if the information between the active PXM and the standby PXM is synchronized. To ensure an accurate log of discrepancies, wait for the **verifydiskdb check** to finish running before you provision connections.

Configuring a Line Loopback

If a connection fails and you do not know which end of the connection is causing the problem, putting a line into loopback mode can help you determine what the problem is and where it occurs on a connection. In an MGX 8830, an MGX 8850, or an MGX 8880, loopback lines provide CLI-based line level monitoring capabilities.

When a line is put into loopback, the receiving switch takes all of the data it receives and returns it unchanged back to the sender. The physical line in a loopback configuration is connected between a CPE and a switch; one physical line is connected from the tx (Transmit port) of the CPE to the rx (receive) port of a card on the switch you are testing. Another physical line is connected between the tx port of the same card and the receive port of the CPE.

Configuring Loopback Line Tests on PXM1E and AXSM Cards

Once the physical connection is established, you need to use the CLI to put the connection into loopback mode.

The following types of loopback are supported on PXM1E and AXSM cards:

- Far-end line loopback - Loopback appears at the far-end of the CPE when you send a loopback activation code from the PXM1E. The CPE enters a loop mode in which it returns the received data back to the PXM1E. The CPE continues to return the data back until it receives a no-loopback request.This kind of loopback can be used to run tests, such as BERT.
- Far-end payload loopback- Loopback is similar to FarEnd loopback, except that the payload portion of the data is re-transmitted. Framing is done by the Far end again.
- Remote line loopback - Loopback returns the remote data back to the far end. The received data stream is looped back into the transmit path, overriding the data stream created internally by the framer.
- Local loopback - Loopback allows the transmitted data to be looped back into the receiving path. It can be used to test the internal hardware of the card.

Once your physical line is connected, you can perform a loopback test using the following procedure.

Step 1 Connect a single line to the appropriate transfer and receive ports on the backcard you want to test.

Step 2 Establish a configuration session with the active PXM1E or AXSM card using a user name with SERVICE_GP privileges or higher.

Step 3 Enter the **dsplns** command to display the configuration for all lines on the current card.

Step 4 Enter the **addlnloop** <-line type> <bay.line> <-lpb loopback type> command.

```
addlnloop -ds3 2.1 -lpb 2
```

Step 5 Enter the **dspln** -<*line type*> <*line_num*> command to verify the that the appropriate line is in the specified loopback state.

```
dspln -ds3 4.1
```

Note Before you can change the loopback type for an existing loopback, you must first delete the loopback by executing **dellnloop**, or you can just enter the **addlnloop** command with the -lpb 1 (No loopback) option.

Configuring a Line Loopback on a Service Module

Once your physical line is connected, you can perform a loopback test using the following procedure.

Step 1 Connect a single line to the appropriate transfer and receive ports on the backcard you want to test.

Step 2 Establish a configuration session with the active PXM1E or AXSM using a user name with SERVICE_GP privileges or higher.

Step 3 Enter the **dsplns** command to display the configuration for all lines on the current card.

Step 4 Enter the **addlnloop** <-line type> <bay.line> <-lpb loopback type> command.

```
addlnloop -ds3 2.1 -lpb 2
```

Step 5 Enter the **dspln** -<*line type*> <*line_num*> command to verify the that the appropriate line is in the specified loopback state.

```
dspln -ds3 4.1
```

Before you can change the loopback type for an existing loopback, you must first delete the loopback by executing **dellnloop**, or you can just enter the **addlnloop** command with the -lpb 1 (No loopback) option.

Managing Bit Error Rate Tests

BERT commands can help you analyze and resolve problems on a physical interface. To conduct a BERT on a line, a user sends a specified pattern over a line that is configured in loopback mode at the far end. The local end receives the loopback pattern, and the user compares the local end pattern to the original pattern sent from the far end. The number of bit errors discovered in the local (or receive) end pattern help the user determine the quality of the physical line.

Note BERT is only available for T1 lines and IMA cards.

Configuring a Bit Error Rate Test

Use the following procedure to configure BERT on an MGX switch.

Step 1 Put the appropriate lines into loopback mode.

Step 2 Establish a configuration session with the active PXM1E or PXM45 using a user name with SERVICE_GP privileges or higher.

Note BERT commands are available only on PXM1E and PXM45 cards. However, you can run BERT on any service modules that support T1 lines or IMA.

Step 3 Enter the **dspbertcap** command to display the loopback and BERT capabilities of a specific line or port on the current card. The display shows you which test patterns and loopback numbers are available on the current service module.

```
dspbertcap <SM Interface> <Test Option>
```

Table 9-33 describes the **dspbertcap** command parameters.

Table 9-33 dspbertcap Command Parameters

Parameter	Description
SM Interface	The format of Service Module Interface is: SMslot.SMLine[.SMport], as follows: • SMslot can have a value in one of the following ranges: 1-6, 9-14, 17-22, 25-30. • SMLine has a range from 1 though the maximum number of lines on the card. • The optional SMport has a value from 1 though the maximum ports supported by the service module.
Test Option	Type one of the following numbers to select the capability to display: 1: BERT capability 2: Loopback capability

Step 4 Enter the **cnfbert** command as follows to set up BERT parameters on the looped back connection. You must use the available test patterns and loopback numbers displayed with the **dspbertcap** command in Step 3.

```
Unknown.7.PXM.a > cnfbert -cbif <LSMnum> -pat <bertPattern> -lpbk <lpbk> -sbe
<singleBitErrInsert> -cir <dropIteration> -en <enable>
```

Table 9-34 cnfbert Command Parameters

Parameter	Description
LSMnum	Where LSMnum = LSMslot.Line.Port LSMslot = 1-6,9-14,17-22,25-30 Line = 1 - MAX_LINES Port = 1 - MAX_PORTS for Port Test, 0 for Line Test
bertPattern	Test pattern to be generated. See the list of patterns supported for a complete listing. for details use dspbertcap command.
lpbk	For details use **dspbertcap** command.

Table 9-34 cnfbert Command Parameters

singleBitErrInsert	Different options of error insertion rates, where singleBitErrInsert is “1” (noError), or “| 2" (insert). **Note** Injection of bit error should be done after configuring BERT
dropIteration	where dropIteration is between 1 and 32, used only if loopback is 5:latchDS0Drop.
enable	Enables/disables BERT. Enter “4” to enable BERT or “6” to disable BERT.

In the following example, the user enables a BERT on line 1 in port 0 on the service module in slot 25. The BERT pattern is set to 1 (all zeros), and loopback is set to 14.

```
Unknown.7.PXM.a > cnfbert -cbif 25.1.0 -pat 1 -lpbk 14 -en 6
```

Step 5 After the BERT has been running for at least 30 minutes, enter the **dspbert** <*bay*> command to display the BERT result. Replace bay with 0 to indicate the upper bay, or 1 to indicate the lower bay.

Note For the PXM1E, the bay will always be **2** because BERT is only run on the lower bay. BERT is supported on both bays for AXSM cards.

Note The **dspbert** command can be issued even while the BERT is in operation.

```
Unknown.7.PXM.a > dspbert 2
```

Replace bay with 1 to indicate the lower bay.

```
Unknown.7.PXM.a > dspbert 2

        Start Date                    : 08/29/2002
        Current Date                  : 08/29/2002
        Start Time                    : 18:43:07
        Current Time                  : 16:56:23
        Physical Slot Number          : 22
        Logical Slot Number           : 22
        Line Number                   : 1 (Line test)
        Device To Loop                : Local Loopback
        BERT Pattern                  : Double One Zero Pattern
        Error Inject Count            : 0
        Bit Count                     : 3091031099
        Bit Count Received            : 3091031099
        Bit Error Count               : 0
        Bit Error Rate (BER)          : 0
        Bit Counter Overflowed        : 6 <times>

                BERT is in sync.
```

Deleting a Configured Bit Error Rate Test

There are two ways to terminate a configured BERT.

1. Enter the **delbert** <*SM Interface*> command. Replace <*SM Interface*> with the service module interface number in the format slot.line.port. In the following example, the user deletes BERT from line 1 on port 2 in the PXM1E in slot 7.

```
Unknown.7.PXM.a > delbert 7.1.1
```

2. Enter the **cnfbert** command with the -en option disabled. (See Table 9-34 for a description of the **cnfbert** command parameters.)

```
Unknown.7.PXM.a > cnfbert -cbif 25.1.0 -pat 1 -lpbk 14 -en 6
```

Managing PXM1E and AXSM Card Diagnostics

Diagnostics tests run on all the major hardware components that belong to the PXM1E or AXSM front card and its lower back cards, and the connection path between these components. You can configure a hardware-oriented test to check the health of the active and standby PXM1E or AXSM front card. Tests can be run on the standby card, the active card, or both cards at the same time.

PXM1E and AXSM cards support both online and offline diagnostics.

- Online diagnostics tests run in the background while a card is in an operational state. These tests are non-intrusive and run with minimal overhead. Online diagnostics can be used to detect hardware errors. The goal is to monitor any potential errors at a card level while a card is in normal operation. You can stop a test by issuing a new diagnostic configuration to disable it. If the online diagnostics test fails on an active AXSM, a switchover is triggered, the active card becomes the standby, and an error message appears declaring that the standby card as failed. If the online diagnostics test fails on an active PXM1E, no switchover is triggered.

Note Online diagnostics do not detect operational errors.

- Off-line diagnostics ensure the standby card is ready to be switched over to. Offline diagnostics tests are performed only on the standby card. Areas for diagnosis include hardware components and cell paths. Off-line diagnostics are destructive. Intensive tests are performed on a card including memory tests and registers read/write tests. It temporarily puts a standby card out of service and makes it unavailable to be switched over to in case of active card failure. When tests are done, the card is reset to its normal state. If the active card fails while the standby card is running off-line diagnostics, off-line diagnostics are immediately aborted

AXSM cards run offline diagnostics in the following areas:

- Processor subsystem: NVRAM and BRAM
- ASIC tests: Atlas (register test, ingress memory, egress memory) and framer (register test)

PXM1E cards run registered offline diagnostics on UI- S3 or UI-S3/B back cards.

Both control path and data path must to be tested in order to have complete test coverage on the entire connection path within a card. The control path is the path that carries IPC messages between cards. The diagnostic data path is the path for cells travelling between the backplane and the loop back device.

Configuring Offline and Online Diagnostics Tests on PXM1E and AXSM Cards

Enter the **cnfdiag** command as follows to enable online diagnostics tests on PXM1E or AXSM cards:

```
MGX.7.PXM.a > cnfdiag <slot> <onEnb> <offEnb> [<offCover> <offStart> <offDow>]
```

Table 9-35 tells you how to set these parameters to run online diagnostics tests on PXM1E and AXSM cards.

Table 9-35 cnfdiag Command Parameters

Parameter	Description
slot	Enter the slot of the card for which to configure the diagnostics. For the PXM1E, the slot number will be *7* or *8*.
onEnb	Enter *enable* to enable online diagnostic on the card. Enter *disable* to disable online diagnostics.
offEnb	Enter *enable* to enable offline diagnostics. Enter *disable* to disable offline diagnostics.
offCover	Set the offline diagnostics coverage time to light, medium, or full. light = 5 minutes or less medium = 30 minutes or less full = any number of minutes-no limit **Note** You do not need to set this parameter if you are not enabling offline diagnostics.
offStart	Set the time for the offline diagnostics to begin using 24 hour time. The format is: hh:mm. For example: 03:45 or 22:30 **Note** You do not need to set this parameter if you are not enabling offline diagnostics.
offDow	Sets the day of the week for the offline diagnostics to run. The format is SMTWTFS. **Note** You do not need to set this parameter if you are not enabling offline diagnostics.

Warning **Do not remove the active PXM while the offline diagnostic is running on the redundant PXM. If you remove it, the redundant PXM reboots but will not be able to become active unless its hard disk drive was previously synchronized to the hard disk on the previously active PXM.**

Example 9-1 Configuring online diagnostics only

In the following example, the user enables online diagnostics only for the PXM1E in slot 7.

```
MGX.7.PXM.a > cnfdiag 7 enable disable
```

Example 9-2 Configuring offline diagnostics only

In the following example, the user enables online diagnostics for the PXM1E in slot 7. A medium online diagnostics coverage test is scheduled to run every Wednesday at 11:30 (11:30 AM).

```
MGX.7.PXM.a > cnfdiag 7 disable enable medium 11:30 -W-
```

Example 9-3 Configuring both online and offline diagnostics at the same time

In the following example, the user enables both online and offline diagnostics for the PXM1E in slot 8. A medium offline diagnostics coverage test is scheduled to run every Monday and Friday at 21:30 (8:30 PM).

```
MGX.7.PXM.a > cnfdiag 7 enable enable medium 21:30 -M-F-
```

To display your online diagnostics test configuration and ensure all the parameters have been set correctly, enter the **dspdiagcnf** command.

Enabling Online and Offline Diagnostics Tests on All Cards in a Switch

Enter the **cnfdiagall** command as follows to enable and configures online or offline diagnostics for all card slots:

```
MGX_a.7.PXM.a > cnfdiagall <slot> <onEnb> <offEnb> [<offCover> <offStart> <offDow>]
```

Table 9-36 describes the **cnfdiagall** command parameters.

Table 9-36 cnfdiagall Command Parameters

Parameter	Description
onEnb	Enable or disable online diagnostics. The default is disable.
offEnb	Enable or disable offline diagnostics. The default is disable.
offCover	Set the offline diagnostics coverage time to light, medium, or full. • light = 5 minutes or less • medium = 30 minutes or less • full = any number of minutes-no limit
offStart	Set the time for the offline diagnostics to begin using 24 hour time. The format is: hh:mm. For example: 03:45 or 22:30
offDow	Sets the day of the week for the offline diagnostics to run. The format is SMTWTFS. For example: -M-W--- is Mondays and Wednesdays only.

Example 9-4 Configuring online diagnostics only

In the following example, the user enables online diagnostics only for all cards in the switch.

```
Unknown.7.PXM.a > cnfdiagall 7 enable disable
```

Example 9-5 Configuring offline diagnostics only

In the following example, the user enables online diagnostics for all cards in the switch. A medium online diagnostics coverage test is scheduled to run every Wednesday at 11:30 (11:30 AM).

```
Unknown.7.PXM.a > cnfdiagall 7 disable enable medium 11:30 -W-
```

Example 9-6 Configuring both online and offline diagnostics at the same time

In the following example, the user enables both online and offline diagnostics for all cards in the switch. A medium offline diagnostics coverage test is scheduled to run every Monday and Friday at 21:30 (8:30 PM).

```
Unknown.7.PXM.a > cnfdiagall 7 enable enable medium 21:30 -M-F-
```

To display your online diagnostics test configuration and ensure all the parameters have been set correctly, enter the **dspdiagcnf** command.

Displaying Online and Offline Diagnostics Test Configuration Information

Enter the **dspdiagcnf** command to display the current diagnostics configuration on a card. The **dspdiagcnf** command displays the following information:

- Slot number
- Whether online diagnostics are enabled or disabled
- Whether offline diagnostics are enabled or disabled
- The type of coverage currently running for offline diagnostics
- The start time for offline diagnostics
- The day(s) of the day on which offline diagnostic tests are scheduled to run.

The following example shows the information displayed by the **dspdiagcnf** command.

```
Unknown.7.PXM.a > dspdiagcnf
      Online   -------------- Offline -------------
Slot  Enable   Enable  Coverage  StartTime  SMTWTFS
----  ------   ------  --------  ---------  -------
1     enable   enable  light     15:13      ---W---
2     enable   enable  light     15:13      ---W---
3     enable   enable  light     15:13      ---W---
4     enable   enable  light     15:13      ---W---
5     enable   enable  light     15:13      ---W---
6     enable   enable  light     15:13      ---W---
7     disable  enable  light     15:13      ---W---
8     enable   enable  light     15:13      ---W---
9     enable   enable  light     15:13      ---W---
10    enable   enable  light     15:13      ---W---
11    enable   enable  light     15:13      ---W---
12    enable   disable light     15:13      ---W---
13    enable   enable  light     15:13      ---W---
14    enable   enable  light     15:13      ---W---
15    disable  disable light     15:13      ---W---
16    disable  disable light     15:13      ---W---
17    enable   enable  light     15:13      ---W---
18    enable   enable  light     15:13      ---W---
19    enable   enable  light     15:13      ---W---

Type <CR> to continue, Q<CR> to stop: 20    enable   enable  light     15:13
    Type <CR> to continue, Q<CR> to stop:
    20    disable  disable light     00:00      SMTWTFS
    21    disable  disable light     00:00      SMTWTFS
    22    disable  disable light     00:00      SMTWTFS
    23    disable  disable light     00:00      SMTWTFS
    24    disable  disable light     00:00      SMTWTFS
    25    disable  disable light     00:00      SMTWTFS
    26    disable  disable light     00:00      SMTWTFS
    27    disable  disable light     00:00      SMTWTFS
    28    disable  disable light     00:00      SMTWTFS
    29    disable  disable light     00:00      SMTWTFS
    30    disable  disable light     00:00      SMTWTFS
    31    disable  disable light     00:00      SMTWTFS
    32    disable  disable light     00:00      SMTWTFS

    janus4.7.PXM.a >
```

Displaying Online Diagnostic Errors

Enter the **dspdiagerr online** command to display the current online diagnostics errors for all cards in a switch.

```
Unknown.7.PXM.a > dspdiagerr online
 Slot Date   Time  Message
 ---- ----   ----  -------
1    --     --
2    --     --
3    --     --
4    --     --
5    --     --
6    --     --
7    --     --
8    --     --
9    --     --
10   --     --
11   --     --
12   --     --
13   --     --
14   --     --
15   --     --
16   --     --
17   --     --
18   --     --
19   --     --
20   --     --

Type <CR> to continue, Q<CR> to stop: 21   --     --
```

Displaying Offline Diagnostic Errors

Enter the **dspdiagerr offline** command to display the current online diagnostics errors for all cards in a switch,

```
Unknown.7.PXM.a > dspdiagerr offline
 Slot Date   Time  Message
 ---- ----   ----  -------
1    --     --
2    --     --
3    --     --
4    --     --
5    --     --
6    --     --
7    --     --
8    --     --
9    --     --
10   --     --
11   --     --
12   --     --
13   --     --
14   --     --
15   --     --
16   --     --
17   --     --
18   --     --
19   --     --
20   --     --

Type <CR> to continue, Q<CR> to stop: 21   --     --
```

Enter the **dspdiagstat** command to display the number of times that the diagnostics has run. The output shows the number of attempts and the number of failures for both offline and online diagnostics.

```
Unknown.7.PXM.a > dspdiagstat 7

Slot 7 diagnostics statistics:

online diag attempted  = 0x00001a26
online diag passed     = 0x00001a26
online diag failed     = 0x00000000
offline diag attempted = 0x00000000
offline diag passed    = 0x00000000
offline diag failed    = 0x00000000
```

Enter the **dspdiagstatus** command to display the diagnostics status and role (active or standby) for each card on the switch. The diagnostics statuses are:

- Idle—Slot is in an idle state because there is no card in the slot, or due to an error.
- Ready—Card is active and ready for diagnostics test.
- Offline—Card is offline.
- Online—Card is online,

Enter the **dspdiagstatus** command as shown in the following example:

```
Unknown.7.PXM.a > dspdiagstatus
 Slot  State    Role
 ----  -----    ----
1      Idle     UNKNOWN CARD ROLE
2      Idle     UNKNOWN CARD ROLE
3      Idle     UNKNOWN CARD ROLE
4      Idle     UNKNOWN CARD ROLE
5      Idle     UNKNOWN CARD ROLE
6      Idle     UNKNOWN CARD ROLE
7      Ready    ACTIVE CARD ROLE
8      Idle     UNKNOWN CARD ROLE
9      Idle     UNKNOWN CARD ROLE
10     Idle     UNKNOWN CARD ROLE
11     Idle     UNKNOWN CARD ROLE
12     Idle     UNKNOWN CARD ROLE
13     Idle     UNKNOWN CARD ROLE
14     Idle     UNKNOWN CARD ROLE
15     Ready    ACTIVE CARD ROLE
16     Idle     UNKNOWN CARD ROLE
17     Idle     UNKNOWN CARD ROLE
18     Idle     UNKNOWN CARD ROLE
19     Idle     UNKNOWN CARD ROLE
20     Idle     UNKNOWN CARD ROLE

Type <CR> to continue, Q<CR> to stop:
```

Enabling and Disabling IMA Group ATM Cell Layer Parameters

The **cnfatmimagrp** allows you to enable and disable the following ATM cell layer parameters on an IMA group:

- payload scrambling
- AIS

To configure ATM cell layer parameters on an IMA group, enter the **cnfatmimagrp** command as follows:

cnfatmimagrp -grp <*bay.group*> -sps <*PayloadScramble*> -ais <*aisMode*>

In the following example, the user enables payload scrambling and AIS on the ATM IMA group 14 on the PXM1E in the lower bay.

```
Unknown.7.PXM.a > cnfatmimagrp -grp 2.14 -sps 1 -ais 1
```

Table 9-37 describes the parameters for the **cnfimagrp** command.

Table 9-37 cnfatmimagrp Command Parameters

Parameter	Description
-grp <bay.group>	The bay number and the IMA group number. • bay: Enter 2 for the lower bay. • grp: 1-16 **Note** On the PXM1E, the bay number is always 2.
sps <PayloadScramble>	Enable of disable payload scrambling. Default: enabled. • 1 = enable • 2 = disable
ais <*aisMode*>	Enables or disables the alarm indication signal (AIS) mode. The AIS is an all-ones signal that is transmitted instead of the normal signal to maintain transmission continuity and to indicate to the receiving terminal that there is a transmission fault that is located either at the transmitting terminal or upstream from the transmitting terminal. • 1 = Enable AIS transmitting. • 2 = Disable AIS transmitting. Default = Enable

Enter the **dspatmimagrp** <*bay.group*> command to display whether AIS and payload scrambling are enabled or disabled for an IMA group, as shown in the following example:

```
Satire.2.PXM.a > dspatmimagrp 2.1
 GrpNum   HCScoset PayloadScramble NullCellHdr NullCellPayload   AIS
 ------- --------- --------------- ----------- --------------- -------
      2.1   Enable         Disable  0x00000001              6a Enable
```

Managing IMA

The sections that follow describe how to do the following tasks:

- Display IMA groups
- Display IMA links
- Delete IMA groups
- Deleting IMA links
- Restart an IMA group

Displaying IMA Groups

To display general information about all configured IMA groups on the current PXM1E-16-T1E1, AXSM-32-T1E1-E, or AUSM/B card, enter the **dspimagrps** command, as shown in the following example:

```
Unknown.7.PXM.a > dspimagrps

Ima  Min  Tx   Rx   Tx   Diff                NE-IMA                   FE-IMA  IMA
Grp  Lnks Frm  Frm  Clk  Delay                state                    state  Ver
          Len  Len  Mode (ms)
--------------------------------------------------------------------------------
 2.1   1  128  128  CTC  100                 StartUp                 StartUp  1.0
 2.2   3  128  128  CTC  100                 StartUp                 StartUp  1.1
 2.3   3  128  128  CTC  100                 StartUp                 StartUp  1.1
```

Displaying the Status of a Single IMA Group

To display detailed information about a specific IMA group, enter the **dspimagrp** <*bay.group*> command**.** Replace *bay* with the number *1* to specify the top bay, or *2* to specify the lower bay. Replace *group* with the IMA group number. (Use the **dspimagrps** command to display the configured IMA groups and their group numbers.)

In the following example, the user displays information about the IMA group 2 in the lower bay.

```
M8830_CH.1.PXM.a > dspimagrp 2.1
    Group Number                 : 2.1
    NE IMA Version               : 1.0
    Group Symmetry               : Symm  Operation
    Tx Min Num Links             : 1
    Rx Min Num Links             : 1
    NE Tx Clk Mode               : CTC
    FE Tx Clk Mode               : CTC
    Tx Frame Len (bytes)         : 128
    Rx Frame Len (bytes)         : 128
    Group GTSM                   : Up
    NE Group State               : Operational
    FE Group State               : Operational
    Group Failure Status         : No Failure
    Tx IMA ID                    : 255
    Rx IMA ID                    : 255
    Max Cell Rate (c/s)          : 14367
    Avail Cell Rate (c/s)        : 14367

Type <CR> to continue, Q<CR> to stop:
```

```
Diff Delay Max  (msecs)         : 275
Diff Delay Max Observed (msecs) : 0
Accumulated Delay (msecs)       : 0
Clear Accumulated Delay Status  : Not In Progress
GTSM Up Integ Time (msecs)      : 0
GTSM Dn Integ Time (msecs)      : 4000
Num Tx Cfg Links                : 4
Num Rx Cfg Links                : 4
Num Act Tx Links                : 4
Num Act Rx Links                : 4
Least Delay Link                : 2.4
Tx Timing Ref Link              : 2.4
Rx Timing Ref Link              : 2.1
Group Running Secs              : 5929483
Alpha Val                       : 2
Beta Val                        : 2
Gamma Val                       : 1
Tx OAM Label                    : 1
Rx OAM Label                    : 1
Test Pattern Procedure Status   : Disabled
Test Link                       : Unknown
Test Pattern                    : 255
Stuff Cell Indication (frames)  : 1
Version Fallback Enabled        : true
Auto-Restart Mode               : disable
Rx IMA ID Expected              : -1
Auto-Restart Sync State         : disable
```

Displaying IMA Links

Enter the **dspimalnk** <*bay.link*> command to display configuration information for the specified IMA link. Replace *bay* with the number *1* to specify the top bay, or *2* to specify the lower bay. Replace *link* with the number of the link you want to display, in the range from 1 through 16.

In the following example, the user displays information about the IMA link 1 in the lower bay.

```
Satire.2.PXM.a > dspimalnk 2.1
  IMA Link Number                 : 2.1
  IMA Link Group Number           : 2.1
  Link Rel Delay (msecs)          : 0
  Link NE Tx State                : Unusable-Failed
  Link NE Rx State                : Not In Grp
  Link FE Tx State                : Not In Grp
  Link FE Rx State                : Not In Grp
  Link NE Rx Failure Status       : LIF Fail
  Link FE Rx Failure Status       : No Failure
  IMA Link Tx LID                 : 0
  IMA Link Rx LID                 : 255
  Link Rx Test Pattern            : 255
  Link Test Procedure Status      : Disabled
  Link LIF Integ UpTime           : 2500
  Link LIF Integ DownTime         : 10000
  Link LODS Integ UpTime          : 2500
  Link LODS Integ DownTime        : 10000
```

Deleting an IMA Group

To delete an IMA group, enter the **delimagrp** <*bay.group*>. Replace *bay* with the number *1* to specify the top bay, or *2* to specify the lower bay. Replace *group* with the IMA group number you want to delete.

In the following example, the user deletes the IMA group 3 in the lower bay.

```
Unknown.7.PXM.a > delimagrp 2.3
```

Enter the **dspimagrps** command to ensure that the correct IMA link is deleted.

Deleting an IMA Link

To delete an IMA link, enter the **delimalnk** <*link*> command. Replace *bay* with the 2 to specify the lower bay. Replace *link* with the IMA link you want to delete, in the range from 1 through 16.

In the following example, the user deletes the IMA link 3 in the lower bay.

```
Unknown.7.PXM.a > delimalnk 2.3
```

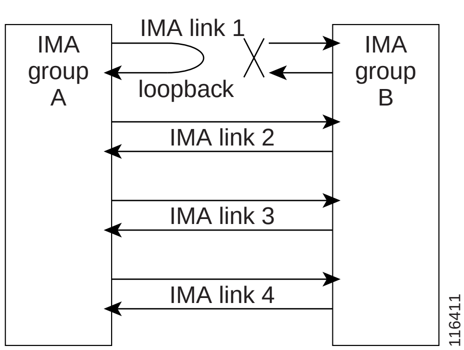
Enter the **dspimalnks** command to ensure that the correct IMA link is deleted.

```
Satire.2.PXM.a > dspimalnks
Link   Grp   Rel              NE               NE          NE Rx   Tx   Rx
Num    Num   Dly              Tx               Rx           Fail  LID  LID
            (ms)           State            State         Status
-----------------------------------------------------------------------------
2.1   2.1     0   Unusable-Failed      Not In Grp        LIF Fail    0  255
2.2   2.1     0   Unusable-Failed      Not In Grp        LIF Fail    0  255
2.4   2.1     0   Unusable-Failed      Not In Grp        LIF Fail    0  255
```

Restarting an IMA Group

An IMA group must be restarted whenever a configuration or link-failure event causes the IMA group to stop operating correctly. Figure 9-3 shows an example situation where an IMA restart may be required.

Figure 9-3 IMA Group Restart Example



In Figure 9-3, one link in IMA Group A is operating in loopback mode, and the other three lines are operating correctly. If different IMA group IDs are configured at each end of the IMA links (**cnfimagrp -txid**), the switch can easily determine which links are in loopback and which links are connected to the far end. If the received far-end ID is the same as the near-end ID, the link is in loopback. If the near and far end IDs are different, the link is communicating with the far-end IMA group.

The following situations can require an IMA restart:

1. All links are in loopback, and then individual links are connected to the remote end. In this scenario, the IMA group is communicating with itself and must be restarted so that it will start communicating with the far end.
2. One link is in loopback and the other links fail after successful communications have been established with the far end. This situation creates an error condition for the IMA group which can be cleared by restarting the IMA group and allowing the IMA group to communicate with itself over the loopback link.
3. The failed links in situation 2 recover while the IMA group is communicating with itself. This is really the same as situation 1. The IMA group must be restarted so that the IMA group can establish communications with the far end.

Note A restart will correct the problem in all three of the situations described above if a different IMA group ID is configured for the near and far ends. If the same IMA group ID is configured at both ends, it is possible that the links in loopback will respond first and the IMA group will not communicate with the far end.

Cisco MGX switches allow you to manually restart an IMA group to correct communications problems. Beginning with Release 5, you can also enable and configure the IMA autorestart feature, which will automatically restart an IMA group when necessary. The following sections describe how to use the manual and automatic restart features.

Using Manual IMA Group Restart

To manually restart an IMA group, enter the **restartimagrp** <*bay.group*> command. Replace *bay* with the number **1** to specify the top bay, or **2** to specify the lower bay. Replace *group* with the IMA group you want to restart (To display the configured IMA groups, enter the **dspimagrps** command).

After you enter the **restartimagrp** command, the IMA group attempts to re-establish the IMA protocol with far end of a failed connection.

In the following example, the user attempts to restart the IMA group number 6 in the lower bay.

```
Unknown.7.PXM.a > restartimagrp 2.6
```

Using Automatic IMA Group Restart

The IMA autorestart feature is new for PXM1E-16-T1E1 in Release 5. To enable and configure the IMA autorestart feature, use the following procedure.

Note The IMA autorestart feature is a Cisco enhancement to the IMA operation described in the IMA specifications. The IMA specifications do not provide for the detection of lines in loopback mode and for automatic restart.

Step 1 Establish a configuration session with the active PXM1E-16-T1E1 using a user ID with GROUP1 privileges or higher.

Step 2 Enter the **dspimaparms** command as shown in the following example to determine whether the autorestart feature is enabled on the switch.

```
M8830_CH.1.PXM.a > dspimaparms

            IMA Parameters
    ================================
    Max IMA Groups Supported : 16
    Configured IMA Groups    : 1
    Min IMA ID Range         : 0
    Max IMA ID Range         : 255
    IMA Ver Fallback         : Enable
    IMA Auto-Restart         : Disable
```

Step 3 If the autorestart feature is not enabled on the node, enable it with the **cnfimaparms** command as shown in the following example:

```
M8830_CH.1.PXM.a > cnfimaparms -restart 1
```

Step 4 To display the autorestart feature configuration for a specific IMA group, enter the **dspimagrp** command as described in the "Displaying the Status of a Single IMA Group" section, which appears earlier in this chapter. For more information on autorestart information in the dspimagrp command display, see "Displaying the IMA Group Autorestart Configuration and State" section, which appears later in this chapter.

Step 5 To configure the autorestart feature for a specific IMA group, enter the **cnfimagrp** command using the following format:

```
M8830_CH.1.PXM.a > cnfimagrp -grp <group> [-mode <autoRestart>] [-rxid <rxImaIdExpected>]
```

Replace the *group* variable with the IMA group number as it appears in the **dspimagrp** and **dspimgrps** command displays.

Include the -mode option when you need to change the autorestart mode for the group. Replace the *autoRestart* variable with **1** to disable autorestart for this group, **2** to enable autorestart and relearn the far end ID on restart, and **3** to enable autorestart and reuse the previously learned far end ID on restart.

The -rxid parameter is optional and specifies the far end IMA ID to expect on autorestart. If a far end ID is or will be configured on the IMA group (using **cnfimgrp -txid** option on MGX switches), enter this ID with the -rxid option on the near end to help the switch determine whether an IMA group link is in loopback. Be sure to specify an IMA far end ID that is different from the near end ID. The range is -1 to 255. Enter the -rxid option with -1 to configure the IMA group to learn the far end user ID when the IMA group starts.

Cisco recommends two configurations for the autorestart feature. The preferred configuration is to set the -mode option to reuse (3) the far end ID and set the -rxid option to -1. This configuration causes the IMA group to learn the far end ID the first time the IMA group starts and reuse that IMA group ID on all future restarts.

The second configuration sets the -mode option to relearn (2) the far end ID and sets the -rxid option to -1. This configuration causes the IMA group to learn the far end ID every time the IMA group starts. To make the far end ID persistent after it is learned, you must enter the cnfimagrp command a second time and change the -mode option to 3 (reuse).

The following example configures IMA group 2.1 to use the preferred configuration:

```
M8830_CH.1.PXM.a > cnfimagrp -grp 2.1 -mode 3 -rxid -1
```

Note The **cnfimagrp** command provides additional parameters. All **cnfimagrp** parameters are described in Table 3-5.

Step 6 To verify an IMA group configuration change, enter the **dspimagrp** command.

Displaying the IMA Group Autorestart Configuration and State

Starting with Release 5, three new rows have been added to the **dspimagrp** <*group*> command to show the autorestart state for an IMA group. To display an IMA group autorestart state, enter the **dspimagrp** command as described in the "Displaying the Status of a Single IMA Group" section, which appears earlier in this chapter. The following rows apply to the autorestart feature:

```
Auto-Restart Mode              : disable
Rx IMA ID Expected             : -1
Auto-Restart Sync State        : disable
```

The *Auto-Restart Mode* row displays the mode configured with the **cnfimagrp** command **-mode** option, which is described in the previous section. The *Rx IMA ID Expected* row displays the far end ID configured with the **cnfimagrp** command **-rxid** option, which is also described in the previous section.

The Auto-Restart Sync State row displays one of the following states:

- disable—Autorestart is disabled for this IMA group.
- loopbackSync—All IMA links in this group are synchronized with an ID that is the same as the near end ID.
- feSync—At least on IMA link in this group is synchronized with an ID that is the same as the expected far end ID.
- tempSync—All IMA links in this group are synchronized with an IMA ID, but the ID does not match the near end ID or the expected far end ID.
- inProgress—Autorestart is enabled, but the IMA group has not yet reached the loopbackSync, feSync, or tempSync state.

CHAPTER 10

Switch Maintenance Procedures

This chapter describes the configuration changes that are needed after a switch has been initialized, started, and configured, and you want to do any of the following tasks:

- Manual reset of the PXM
- Add cards
- Replace cards
- Upgrade cards
- Decommission a card slot
- Decommission an RPM slot

Service module and SRM slots must be decommissioned when you want to change the type of card that runs in the slot.

Manually Resetting the PXM

If a PXM should ever require resetting and the CLI is not working, there is an escape sequence that allows you to reset the PXM. Use the following procedure to reset a PXM.

Step 1 Establish a physical connection to the PXM through the Console Port (CP) connector on the PXM-UI-S3 or PXM-UI-S3/B back card.

Caution Anyone with physical access to the switch CP can reset the password, deny access to other users, and reconfigure the switch. To prevent unauthorized switch access and configuration, the switch should be installed in a secure area.

Step 2 Press **ESC, CTRL-X** to reset the PXM.

Adding Cards

After the initial installation and configuration of a Cisco MGX 8850 (PXM1E/PXM45) or Cisco MGX 8830 switch, you can add additional cards to empty slots in the chassis. When you add a card, as opposed to replacing a card, you must configure the switch to recognize the new card. The following sections describe how to configure the switch to recognize the following card additions:

- A standby PXM
- Service modules (AUSM, AXSM, CESM, FRSM, and VISM)
- SRM
- RPM

Adding a Standby PXM Card

During installation, single or redundant PXM cards can be installed in the switch. The procedure for initializing cards after installation is described in the "Initializing the Switch" section in Chapter 2, "Configuring General Switch Features."

When you add a PXM card to the switch, you are adding a standby PXM card to a switch with a single active PXM card.

Note If you are replacing a PXM card that previously operated as either an active or standby card in this switch, refer to the "Replacing Cards" section later in this chapter.

When adding a standby PXM card to your switch, you need to physically install the PXM card and the back cards in the following order:

1. PXM interface card (for PXM1E) or PXM-HD card (for PXM45)
2. PXM-UI-S3 or PXM-UI-S3/B card
3. PXM front card

After the new standby PXM front and back cards are installed, the active PXM card will initialize the standby card set. The initialization procedure takes some time. You can verify that initialization is complete by entering the **dspcd** command with the standby slot number, for example, **dspcd 8**. If the front card state is Standby, initialization is complete.

Adding Service Modules

When you add any new service module to a switch, you are adding new front and back cards to a slot that is not pre-configured for any card. The following procedure describes how to add service modules to unconfigured slots.

Note If the slot has been previously configured for a service module, you can either replace that card with a card of the same type or you can decommission the slot. If you are replacing a service module that previously operated in this switch, see the "Replacing Cards" section later in this chapter.

Note This procedure applies to any of the following service modules: AUSM, AXSM, CESM, FRSM, VISM, and VXSM.

Step 1 Before installing the hardware, enter the **dspcd** command to verify that the slot in which you want to add the card is not configured. In the following example, the **dspcd** report shows that slot 3 is not configured.

```
M8950_DC.7.PXM.a > dspcd 3
M8950_DC                         System Rev: 05.00   Mar. 31, 2004 06:20:34 GMT
MGX8950 (JBP-2)                                      Node Alarm: CRITICAL
Slot Number:   3    Redundant Slot: NONE

                   Front Card           Back Card
                   ----------           ---------
Inserted Card:      ---                 ---
Reserved Card:      UnReserved          UnReserved
State:              Empty               Empty
Serial Number:      ---                 ---
Prim SW Rev:        ---                 ---
Sec SW Rev:         ---                 ---
Cur SW Rev:         ---                 ---
Boot FW Rev:        ---                 ---
800-level Rev:      ---                 ---
800-level Part#:    ---                 ---
CLEI Code:          ---                 ---
Reset Reason:       On Power up
Card Alarm:         NONE
Failed Reason:      None
Miscellaneous Information:


Type <CR> to continue, Q<CR> to stop:
```

Step 2 Install the service module and the appropriate back cards in an unconfigured slot as described in the *Cisco MGX 8850 (PXM1E/PXM45), Cisco MGX 8950, Cisco MGX 8830, and Cisco MGX 8880 Hardware Installation Guide, Releases 2 Through 5*.

After the new service module front and back cards are installed, the Fail LED on the front card flashes and none of the LEDs on the back cards are lit. If you enter the **dspcds** command, the card state in the display appears as Failed.

Step 3 To initialize the slot for the service module, enter the following command:

```
mgx8850a.7.PXM.a > setrev <slot> <revision>
```

Replace <*slot*> with the card slot number for the new service module. Replace <*revision*> with the software version number for the runtime firmware the card will use. You can find the software version number in the *Release Notes for Cisco MGX 8850 (PXM1E/PXM45), Cisco MGX 8950, and Cisco MGX 8830 Switches, Release 5.0.00* and the *Release Notes for the Cisco MGX 8880 Media Gateway, Release 5.0.00*. To determine the version number from the runtime firmware filename, see the "Determining the Software Version Number from Filenames" section in Chapter 9, "Switch Operating Procedures."

Note After installation, each card should be initialized with the **setrev** command only once. For instructions on upgrading the software on a card, see Appendix A, "Downloading and Installing Software Upgrades."

Step 4 When prompted to confirm the command and reset the card, type **y** and press **Return**.

After you confirm the command, the slot initializes, the runtime firmware loads on the service module card, and the card resets. Be patient. The card reset takes a couple of minutes. While the card is resetting, you can enter the **dspcds** command to display the status of the service module card. If you enter the command frequently, you will see the card state change from Empty to Boot/Empty to Empty to Init/Empty and finally to Active/Active.

Step 5 To verify that the new card is running the correct firmware, enter the **dspcd** command with the correct slot number. The following example shows that the AXSM-XG card in slot 16 is running firmware version 5.0(0).

```
M8950_DC.7.PXM.a > dspcd 16
M8950_DC                        System Rev: 05.00   Mar. 31, 2004 06:22:26 GMT
MGX8950 (JBP-2)                                     Node Alarm: CRITICAL
Slot Number:   16   Redundant Slot: NONE

                   Front Card           Back Card
                   ----------           ---------
Inserted Card:      AXSM-4-2488-XG      SMF-4-2488-SFP
Reserved Card:      AXSM-4-2488-XG      SMF-4-2488-SFP
State:              Active              Active
Serial Number:      SAG06142PX4         SAG06200DFZ
Prim SW Rev:        5.0(0)              ---
Sec SW Rev:         5.0(0)              ---
Cur SW Rev:         5.0(0)              ---
Boot FW Rev:        5.0(0)              ---
800-level Rev:      03                  02
800-level Part#:    800-16987-02        800-19913-02
CLEI Code:          0                   0
Reset Reason:       On Power up
Card Alarm:         NONE
Failed Reason:      None
Miscellaneous Information:


Type <CR> to continue, Q<CR> to stop:
```

After you confirm that the service module has been added and is running the correct software, you can start bringing up lines as described in the appropriate service module software configuration guide.

Adding SRM Cards

When you add an SRM card to a switch, you are adding new front and back cards to a slot that is not configured for an SRM card. The following procedure describes how to add SRM cards to unconfigured slots.

Note If the slot has been previously configured for an SRM card, you can either replace that card with a card of the same type or you can decommission the slot.

Step 1 Before installing the hardware, enter the **dspcd** command to verify that the slot in which you want to add the card is not configured. In the following example, the **dspcd** report shows that slot 14 is not configured.

```
pop20one.7.PXM.a > dspcd 14
ERR: The slot specified, has no card configured in it.
ERR: Syntax: dspcd ["slot_number"]
        slot number -- optional;
```

Step 2 Install the SRM card and the appropriate back cards in an unconfigured slot as described in the *Cisco MGX 8850 (PXM1E/PXM45), Cisco MGX 8950, Cisco MGX 8830, and Cisco MGX 8880 Hardware Installation Guide, Releases 2 Through 5*.

Step 3 Configure SRM communications.

Adding RPM Cards

When you add an RPM card to a switch, you are adding new front and back cards to a slot that is not configured for an RPM card. The following procedure describes how to add RPM cards to unconfigured slots.

Note If the slot has been previously configured for an RPM card, you can either replace that card with a card of the same type or you can decommission the slot. If you are replacing an RPM card that previously operated in this switch, see the "Replacing RPM Cards" section later in this chapter. For instructions on decommissioning a slot, see the "Replacing PXM1E-4-155 Cards with PXM1E-8-155 Cards" section later in this chapter.

Step 1 Before installing the hardware, enter the **dspcd** command to verify that the slot in which you want to add the card has not been configured. In the following example, the **dspcd** report shows that slot 14 is not configured.

```
pop20one.7.PXM.a > dspcd 14
ERR: The slot specified, has no card configured in it.
ERR: Syntax: dspcd ["slot_number"]
        slot number -- optional;
```

Step 2 Install the RPM card and the appropriate back cards in an unconfigured slot as described in the *Cisco MGX 8850 (PXM1E/PXM45), Cisco MGX 8950, Cisco MGX 8830, and Cisco MGX 8880 Hardware Installation Guide, Releases 2 Through 5*.

Step 3 Initialize the RPM card as described in the "Initializing RPM Cards" section in Chapter 6, "Preparing RPM Cards for Operation."

Step 4 Verify the RPM software version level as described in the "Verifying the Software Version in Use" section in Chapter 6, "Preparing RPM Cards for Operation."

Step 5 Establish card redundancy as described in the "Establishing Redundancy Between RPM Cards" section in Chapter 6, "Preparing RPM Cards for Operation."

Step 6 Configure RPM communications as described in the *Cisco MGX 8850 Route Processor Module Installation and Configuration Guide*.

Replacing Cards

The procedures in this section describe how to replace cards with another card of the same type. The following sections describe how to do the following:

- Replace PXM cards
- Replace PXM45/A or PXM45/B cards with PXM45/C cards
- Replace AXSM cards with AXSM/B cards
- Replace service modules (AUSM, AXSM, CESM, FRSM, and VISM)
- Replace SRM cards with SRME/B
- Replace RPM cards

Caution When replacing T1 or T3 cards are replaced with E1 or E3 cards, or vice versa, you must enter the **clrsmcnf** command for the appropriate slot before you install the replacement card. For details about using **clrsmcnf** command, refer to the "Clearing a Slot Configuration" section in Chapter 9, "Switch Operating Procedures."

Replacing PXM Cards

PXM front and back cards can be replaced when the switch is operating. If a PXM is operating in standalone mode, all calls are interrupted until the PXM is replaced and operating correctly. If the switch is using redundant PXM cards, you can replace the standby card without interrupting calls. To determine if the card you want to replace is active, enter the **dspcd** *slot* command. If the card you want to replace is the active card, enter the **switchcc** command to place the card in standby mode.

Because PXM card sets store configuration information that controls switch operation, a nativity check is performed each time a PXM front card or hard disk card is added or replaced. If a PXM has been configured in a Cisco MGX switch, the backplane serial number is stored on the PXM front card and on the PXM hard disk (the hard disk is on the PXM1E front card or on a PXM45 back card). If a PXM card is inserted into a chassis or the card is reset with a command such as **resetsys**, the nativity check is run to determine if the PXM cards are native to the chassis. If the chassis serial numbers configured on all PXM cards match the switch chassis serial number, the cards are all native and no special action is required.

The purpose of the nativity check is to resolve configuration differences between PXM cards. Some configuration is stored on the PXM front card and hard disk. This information includes the runtime software version to be used. The actual runtime software is stored on the PXM hard disk.

Note When you replace a PXM card, the replacement card uses the boot software stored on the replacement card and the runtime software configured for slots 7 and 8 in Cisco MGX 8850, MGX 8880, and MGX 8950 switches, or slots 1 and 2 in the Cisco MGX 8830. If the boot software stored on the replacement card is not the correct version, you should upgrade it while the card is operating in standby mode. For instructions on upgrading boot software, see to Appendix A, "Downloading and Installing Software Upgrades."

If one or more cards are replaced, the nativity check identifies which cards are new to the switch chassis and uses the nativity check results to determine which cards hold the valid configuration. This feature can automatically respond to most configuration mismatches, but some mismatches do require a manual response.

The following sections describe how the automatic response feature works for standalone and redundant PXM installations, and how to respond when the system cannot automatically resolve conflicts.

Automatic Response for Standalone PXM Installations

For standalone installations, the nativity check feature detects and responds to PXM cards as shown in Table 10-1.

Table 10-1 Automatic Response to Nativity Checks in Standalone Installations

Event	PXM Type	Nativity Check Results	Response
PXM front card and hard disk card have not changed.	PXM1E	Native front card.	No action is required.
	PXM45	Native front card and native hard disk card.	
PXM front card has been replaced with an unconfigured card.	PXM1E	New PXM1E.	There is no existing configuration to use. You must configure the switch or restore a saved configuration.
	PXM45	New PXM45 and native hard disk card.	The switch builds the PXM45 front card configuration from the configuration on the hard disk.
PXM front card has been replaced with a previously configured front card from another chassis.	PXM1E	Non-native front card.	You must manually resolve the configuration conflict as described in the "Manually Responding to Nativity Checks" section which appears later in this chapter.
	PXM45	Non-native front card and native hard disk card.	The switch rebuilds the PXM45 front card configuration from the configuration on the hard disk.
The hard disk card has been replaced with an unconfigured card.	PXM45	Native front card, new hard disk card.	The hard disk configuration cannot be completely built from the configuration on the front card. You must manually resolve the configuration conflict as described in the "Manually Responding to Nativity Checks" section which appears later in this chapter.
The hard disk card has been replaced with a previously configured hard disk card from another chassis.	PXM45	Native front card, non-native hard disk card.	The hard disk configuration cannot be completely rebuilt from the configuration on the front card. You must manually resolve the configuration conflict as described in the "Manually Responding to Nativity Checks" section which appears later in this chapter.
PXM front card and hard disk card are replaced with unconfigured cards.	PXM45	New front card and new hard disk card.	There is no existing configuration to use. You must configure the switch or restore a saved configuration.

Table 10-1 Automatic Response to Nativity Checks in Standalone Installations (continued)

Event	PXM Type	Nativity Check Results	Response
PXM front card and hard disk card are replaced with a set that was configured in another switch.	PXM45	Non-native front card and non-native hard disk card.	The standalone PXM enters the failed state. You must manually resolve the configuration conflict as described in the "Manually Responding to Nativity Checks" section which appears later in this chapter.
Both PXM front card and hard disk card are replaced with cards that were configured in different switches.	PXM45	Non-native front card and non-native hard disk card.	In this scenario, you can clear the configuration stored on the PXM cards, restore a configuration from a saved file, or you can use the configuration stored on the hard disk. You must manually resolve the configuration conflict as described in "Manually Responding to Nativity Checks," which appears later in this chapter.

Automatic Response for Redundant PXM Installations

For redundant PXM installations, the nativity check is performed only on the active PXM card set. If an active PXM card set is operating correctly, you can replace any card in the standby or non-active card set, and the active card set will attempt to configure the replacement card and bring it up in standby mode.

When the entire switch is reset, the nativity check is used to determine which card set gains mastership. The card set that gains mastership will attempt to go active and will resolve nativity conflicts as described in Table 10-1. Table 10-2 shows how the nativity check is used to assign mastership to a PXM card set.

Table 10-2 Mastership Assignment to PXM Card Sets after Nativity Check

Primary Slot[1]	**Secondary Slot**[2]				
Nativity Status	**Both cards non-native**	**Front card non-native**	**Both cards non-native, matched serial numbers**	**Hard disk card non-native**	**Both cards non-native, mismatched serial numbers**
Both cards non-native	No active card set.	Secondary[2] card set is active.	No active card set.	No active card set.	No active card set.
Front card non-native	Primary[1] card set is active.	Primary[1] card set is active.	Primary[1] card set is active.	Primary[1] card set is active.	Primary[1] card set is active.
Both cards non-native, matched serial numbers	No active card set.	Secondary[2] card set is active.	No active card set.	No active card set.	No active card set.

Table 10-2 Mastership Assignment to PXM Card Sets after Nativity Check (continued)

Primary Slot[1]	**Secondary Slot**[2]				
Nativity Status	**Both cards non-native**	**Front card non-native**	**Both cards non-native, matched serial numbers**	**Hard disk card non-native**	**Both cards non-native, mismatched serial numbers**
Hard disk card non-native	No active card set.	Secondary[2] card set is active.	No active card set.	No active card set.	No active card set.
Both cards non-native, mismatched serial numbers	No active card set.	Secondary[2] card set is active.	No active card set.	No active card set.	No active card set.

1. The primary PXM slot is Slot 1 on MGX 8830 switches, Slot 7 on MGX 8850 and MGX 8950 switches, and slot 7 on the MGX 8880 Media Gateway.
2. The secondary PXM slot is Slot 2 on MGX 8830 switches, Slot 8 on MGX 8850 and MGX 8950 switches, and slot 8 on the MGX 8880 Media Gateway.

Manually Responding to Nativity Checks

When a switch cannot automatically resolve a nativity check conflict, the first step to resolution is to use the switch to tell determine the source of the problem and a possible recovery method.

For releases prior to 3.0(20), enter the **sh** command to enter shell mode, and then enter the **shmFailHelp** command to determine the problem. After you discover the problem, enter the **shmFailRecoveryHelp** command to display recommended solutions for problems. For many situations, the **shmFailRecoveryHelp** command will recommend a response. For example, the **shmFailRecoveryHelp** command might recommend that you enter the **shmRecoverIgRbldDisk** command to ignore the nativity check and configure the entire switch using the configuration on the hard disk.

For release 3.0(20) and later, enter the **dspcdhealth** command to see the failure reason and a recommended recovery method. The following example shows the format of this command display:

```
M8850_LA.8.PXM.a > dspcdhealth

* PXM Failed for the following reasons:
*     Fail                         Recovery
*     Reason                       Method
*     ======                       =================
```

Some typical responses to nativity check conflicts include:

- If you saved a configuration with the **saveallcnf** command, you can restore the configuration with the **restoreallcnf** command.
- If there is no configuration available, you can enter a **clrallcnf** command to establish the PXM card sets as new, unconfigured cards in the chassis.
- If a configuration exists on a PXM45 hard drive card, you can use that configuration to configure the front card and establish nativity for the card set.

If the switch cannot resolve a nativity check conflict and all the cards are operating properly, the PXM cards enter stage 1 CLI mode, which offers a reduced set of commands that you can use to resolve the conflict.

When operating in stage 1 CLI mode, you can FTP files to the switch in preparation for a new configuration or a configuration restore. You can FTP files to the switch using the procedures described for copying files to the switch in Appendix A, “Downloading and Installing Software Upgrades.”

To rebuild the configuration from a configured PXM45 hard disk card in the switch, do the following tasks:

- Clear the configuration (**clrallcnf**) on the PXM45 front card using a PXM hard disk card for which the configuration can be erased. (Do not use the PXM45 slot that hosts the configuration you want to use.)
- Install the unconfigured PXM45 front card and the configured PXM45 hard disk card in a chassis without a redundant card set.

The switch will build the PXM45 front card configuration from the configuration on the hard disk.

Replacing PXM1E-4-155 Cards with PXM1E-8-155 Cards

The PXM1E-8-155 card set consists of a a front card, a UI-S3/B back card, and one of two back cards:

- MCC-8-155 STM1 electrical back card—.Supports APS redundancy.
- SFP-8-155 optical back card— Supports APS and Y-cable redundancy. Physical interfaces require installation field replaceable units (FRUs).

Consider the following information when replacing an existing PXM1E-4-155 card set with a PXM1E-8-155 card set:

- The switch must be running software Release 4.0 or later before you can replace a PXM1E-4-155 card with a PXM1E-8-155 card.
- PXM1E front and back cards can be replaced while the switch is operating.
- If a PXM1E-4-155 card set is operating in standalone mode, all calls are interrupted until the PXM1E-4-155 card set is replaced with a fully functioning PXM1E-8-155.
- If the switch is using redundant PXM1E-4-155 card sets with an APS connector, you can upgrade to a PXM1E-8-155 card set without interrupting traffic.
- If the switch is using redundant PXM1E-4-155 card sets without an APS connector, an upgrade to a PXM1E-8-155 card set will interrupt traffic.
- Originally, FRUs were built into the PXM1E-4-155 cards. The PXM1E-8-155 card's SFP-8-155 optical back card requires you to install one FRU for each physical connection on the card. For example, if the PXM1E-4-155 card you are replacing has four connections configured, you will need at least four FRUs in the SFP-8-155 optical back card in order to bring up the same connections on the new PXM1E-8-155 card.
- If you want to upgrade without interrupting traffic, the FRU types must match the type of PXM-4-155 back card you are replacing. For example, if you are replacing a SMFIR-4-OC 3 back card that has four lines configured, you must install four SMF-IR FRUs on the SFP-8-155 back card.

  For detailed information about installing FRUs on a PXM1E-8-155 card, or to see what a FRU looks like, see the *Cisco MGX 8850 (PXM1E/PXM45), Cisco MGX 8950, Cisco MGX 8830, and Cisco MGX 8880 Hardware Installation Guide, Releases 2 Through 5*.

Note Cisco recommends that you have at least four FRUs per PXM1E-4-155 card to ensure that all connections will be active when you replace a configured PXM1E-4-155 card with a PXM1E-8-155 card.

- SC cables are not compatible with PXM1E-8-155 cards. Replace SC cables with the new LC cables. Before you replace a PXM1E-4-155 with a PXM1E-8-155 card, ensure that you have the appropriate number of LC cables required to replace all SC cables that were originally connected to the

PXM1E-4-155 card. You also need to ensure that you have the proper type of LC cable. If you will be connecting the LC cable to an SC connector, you need an SC conversion cable that has an LC connector on one end, and an SC connector on the other end. If you will be connecting the LC cable to another LC connector, you need a cable with an LC connector on both ends.

For detailed information about SC and LC cables, see the *Cisco MGX 8850 (PXM1E/PXM45), Cisco MGX 8950, Cisco MGX 8830, and Cisco MGX 8880 Hardware Installation Guide, Releases 2 Through 5*.

Note Do not do any provisioning on the switch while you are replacing the PXM1E cards.

The sections that follow provide both graceful and ungraceful upgrade procedures for PXM1E-8-155 cards.

Gracefully Replacing a Redundant PXM1E-4-155 Card Set with a Redundant PXM1E-8-155 Card Set

A graceful upgrade is an upgrade that upgrades hardware or software without interrupting established calls. The following conditions must be met before you can gracefully upgrade to a PXM1E-8-155 card set:

- The PXM1E-4-155 is running Release 4.0 or later.
- Intercard APS is configured on the PXM1E-4-155 card set you want to replace. This means that an APS connector is installed on the PXM1E-4-155 back cards. If an APS mini-backplane has not been installed, you need to install it on the PXM1E-4-155 back cards before proceeding with the upgrade.
- If you are installing SFP-8-155 back cards, you have the proper number of LC-to-SC conversion cables. Without LC-to-SC conversion cables, traffic will be interrupted.

Use the following procedure to gracefully replace a redundant PXM1E-4-155 card set with a redundant PXM1E-8-155 card set.

Step 1 Enter the **dspcds** command to verify that the current PXM1E-4-155 card is running Release 4 or later. If the card is running a release that is prior to Release 4, you need to upgrade the entire switch to Release 4 or later as described in Appendix A, "Downloading and Installing Software Upgrades."

Step 2 Enter the **saveallcnf** command to save the existing configuration on the current PXM1E-4-155 card, and FTP that configuration file to a remote location. This ensures that you will be able to go back to your old switch configuration if you need to.

Step 3 Ensure that the active PXM1E-4-155 back card is firmly screwed into the chassis by gently tugging on the back card. If the card feels loose, or if one back card is seated slightly higher or lower in the chassis than the other back card, one of the cards may not be seated properly.

Warning **It is imperative that the active back cards are firmly screwed in and seated properly in the chassis before you remove the standby card set. If the active back cards are even slightly misaligned, traffic may be lost or interrupted during card replacement.**

Step 4 Physically remove the standby PXM1E-4-155 card set (front and back cards) from the switch on which you are performing the upgrade.

Step 5 If you are installing an SFP-8-155 back card, insert FRU connectors into the appropriate ports on the back card before installing new card set into the switch.

If you are installing an MCC-8-155 back card, skip Step 5 and move on to Step 6.

Note Cisco recommends that you install FRUs on the PXM1E-8-155 ports that correspond to the configured ports on the removed standby PXM1E-4-155 back card. For example, if you had a physical SC line connected to port 1 on the removed standby PXM1E-4-155 back card, you need to install a FRU on port 1 of the installed SFP-8-155 back card.

Step 6 Insert the PXM1E-8-155 card set into the appropriate slots. Insert the front card first; then insert the back cards.

Warning **Ensure that the new back cards are firmly screwed into the chassis by gently tugging on them. If one of the standby back cards feels loose, or if the standby back cards are seated slightly higher or lower in the chassis than the active back cards, the new back cards may not be seated properly.**

Step 7 Remove any Y-cables and straight cables connected to the removed standby PXM1E-4-155 back card. If there are no cables attached to the removed standby PXM1E-4-155 back card, proceed to Step 9.

Step 8 Replace SC cables that will be connected to the FRUs in the installed PXM1E-8-155 card with SC-conversion cables. Connect one end of the LC cable to the appropriate FRU on the installed PXM1E-8-155 card. Connect the far end of the LC cable to an SC conversion cable, as described in the "Replacing PXM1E SC Cables with LC Cables via SC Conversion Cables" section later in this chapter.

Note SC conversion cables are required for graceful upgrades.

Step 9 Log into the switch and configure boot parameters on the new PXM1E-8-155 card, as described in the "Setting the LAN IP Addresses" section in Chapter 2, "Configuring General Switch Features."

Step 10 Enter the **dspcds** command and verify that the PXM1E-8-155 comes up in the standby-ready state.

Step 11 Enter the **switchcc** command to switch the roles of the active and standby cards so you can upgrade the non-upgraded card in standby mode. The PXM1E-8-155 now becomes the active card, and the PXM1E-4-155 becomes the standby card.

Step 12 Enter the **dspcds** command to verify that the PXM1E-8-155 comes up in the active-ready state.

Step 13 Physically remove the standby PXM1E-4-155 card set from the switch on which you are performing the upgrade.

Step 14 If you are installing an SFP-8-155 back card, insert FRU connectors into the appropriate ports on the back card before installing new card set into the switch.

If you are installing an MCC-8-155 back card, skip Step 14 and move on to Step 15.

Note Cisco recommends that you install FRUs on the PXM1E-8-155 ports that correspond to the configured ports on the removed standby PXM1E-4-155 back card. For example, if you had a physical SC line connected to port 1 on the removed standby PXM1E-4-155 back card, you need to install a FRU on port 1 of the installed SFP-8-155 back card.

Step 15 Insert the PXM1E-8-155 card set into the appropriate slots. Insert the front card first; then insert the back cards.

Warning **Ensure that the new back cards are firmly screwed into the chassis by gently tugging on them. If one of the standby back cards feels loose, or if the standby back cards are seated slightly higher or lower in the chassis than the active back cards, the new back cards may not be seated properly.**

Step 16 Remove any Y-cables and straight cables connected to the removed standby PXM1E-4-155 back card. If there were no cables attached to the removed standby PXM1E-4-155 back card, proceed to Step 18.

Step 17 Replace SC cables that will be connected to the FRUs in the installed PXM1E-8-155 card with SC-conversion cables. Connect one end of the LC cable to the appropriate FRU on the installed PXM1E-8-155 card. Connect the far end of the LC cable to an SC conversion cable as described in the "Replacing PXM1E SC Cables with LC Cables via SC Conversion Cables" section later in this chapter

Note SC conversion cables are required for graceful upgrades.

Step 18 Enter the **dspcds** command and verify that the standby PXM1E-8-155 comes up in the standby-ready state.

Step 19 At the active PXM1E-8-155, enter the **commithw** <*Slot Number*> **1** command to commit the hardware upgrade on the switch. Replace <*Slot Number*> with the slot number for the active PXM1E-8-155 card. In a Cisco MGX 8850 (PXM1E) switch, the <*Slot Number*> parameter can be 7 or 8. In a Cisco MGX 8830 switch, the <*Slot Number*> parameter can be 1 or 2. The number **1** specifies that this card has been upgraded from a PXM1E-4-155 to a PXM1E-8-155.

In the following example, the user commits the hardware upgrade on the PXM1E-8-155 in slot 2 of an MGX 8830 switch.

```
pxm1e.2.PXM.a > commithw 2 1
```

Step 20 Enter the **dspcd** <*slotnumber*> command to verify that the reserved front card is a PXM1E-8-155. Replace <*slotnumber*> with the slot number of the active PXM1E card.

Step 21 If you have APS lines on the installed PXM1E-8-155 card, enter the **dspaps** command to verify that the APS lines are OK and clear of alarms.

Non-gracefully Upgrading a Single PXM1E-4-155 to a PXM1E-8-155

A nongraceful upgrade is a software or hardware upgrade that interrupts some or all established calls. When you perform a nongraceful PXM1E upgrade, all calls are interrupted. To non-gracefully replace a single PXM1E-4-155 to a PXM1E-8-155, use the following procedure:

Step 1 Enter the **dspcds** command to verify that the current PXM1E-4-155 card is running Release 4 or later. If the card is running a release that is prior to Release 4, you need upgrade the entire switch to Release 4 or later as described in Appendix A, "Downloading and Installing Software Upgrades."

Step 2 Enter the **saveallcnf** command to save the existing configuration on the current PXM1E-4-155 card, and FTP that configuration file to a remote location. This ensures that you will be able to go back to your old switch configuration if you need to.

Step 3 Physically remove the PXM1E-4-155 card set (front and back cards) from the switch on which you are performing the upgrade, and replace it with the PXM1E-8-155 card set.

Step 4 If you are installing an SFP-8-155 back card, insert FRU connectors into the appropriate ports on the back card before installing new card set into the switch.

If you are installing an MCC-8-155 back card, skip Step 4 and move on to Step 5.

Note Cisco recommends that you install FRUs on the PXM1E-8-155 ports that correspond to the configured ports on the removed standby PXM1E-4-155 back card. For example, if you had a physical SC line connected to port 1 on the removed standby PXM1E-4-155 back card, you need to install a FRU on port 1 of the installed SFP-8-155 back card.

Step 5 Insert the PXM1E-8-155 card set into the appropriate slots. Insert the front card first; then insert the back cards.

Step 6 Ensure that the new back cards are firmly screwed into the chassis by gently tugging on them. If one of the standby back cards feels loose, the new back cards may not be seated properly.

Step 7 Remove any cables connected to the removed PXM1E-4-155 back card. If there were no cables attached to the removed standby PXM1E-4-155 back card, proceed to Step 8.

Step 8 Replace SC cables that will be connected to the FRUs in the installed PXM1E-8-155 card with appropriate LC cables or SC conversion cables.

Note If the LC cable will be linked to an SC cable on the far-end, you will need a cable with and LC connector on one end and SC connector on the other end. If the LC cable will be linked to another LC connector on the far end, you will need a cable with an LC connector on both ends.

Step 9 Log into the switch and configure boot parameters on the new PXM1E-8-155 card, as described in the "Setting the LAN IP Addresses" section in Chapter 2, "Configuring General Switch Features."'

Step 10 Enter the **dspcds** command to verify that the PXM1E-8-155 comes up in the active-ready state.

Step 11 FTP the original PXM1E-4-155 configuration file onto current switch. This is the file that you saved to a remote location in Step 2.

Step 12 Enter the **restoreallcnf** command to restore the old configurations on the current switch.

Step 13 Enter the **commithw** <*Slot Number*> **1** command to commit the hardware upgrade on the switch. Replace <*Slot Number*> with the slot number for the active PXM1E-8-155 card. In a Cisco MGX 8850 (PXM1E) switch, the <*Slot Number*> parameter can be 7 or 8. In a Cisco MGX 8830 switch, the <*Slot Number*> parameter can be 1 or 2. The number **1** specifies that this card has been upgraded from a PXM1E-4-155 to a PXM1E-8-155.

In the following example, the user commits the hardware upgrade on the PXM1E-8-155 in slot 2 of an MGX 8830 switch.

```
pxm1e.2.PXM.a > commithw 2 1
```

Step 14 Enter the **dspcd** <*slotnumber*> command to verify that the reserved front card is a PXM1E-8-155. Replace <*slotnumber*> with the slot number of the active PXM1E card.

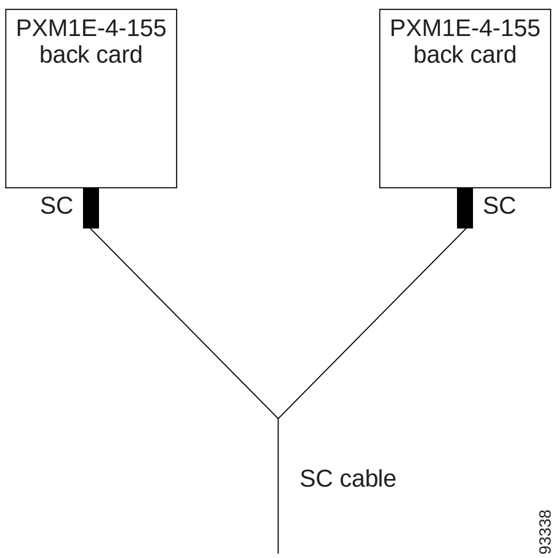
Replacing PXM1E SC Cables with LC Cables via SC Conversion Cables

When performing a graceful upgrade of a PXM1E-4-155 card set that uses SC cables to a PXM1E-8-155 card set, you will need to install SC conversion cables to complete the upgrade. SC conversion cables have an LC connector on one end, and an SC connector on the other. The LC connector fits into the FRUs you install in the SFP-8-155 back card. The SC connector can connect to another SC cable.

Use the following procedure during a graceful PXM-8-155 upgrade if you need to install SC conversion cables.

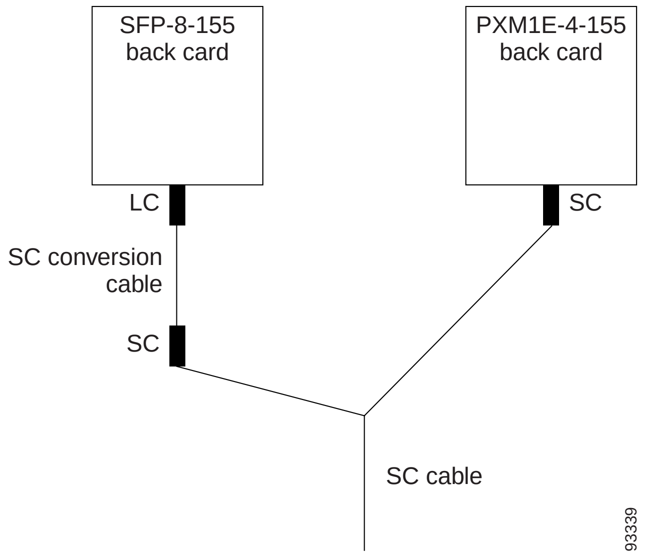
Step 1 Figure 10-1shows an example of a PXM1E-4-155 back card Y-cable configuration that uses SC cables. This is what the configuration looks like prior to the PXM-8-155 upgrade.

Figure 10-1 PXM1E-4-155 Back Cards with SC Cable



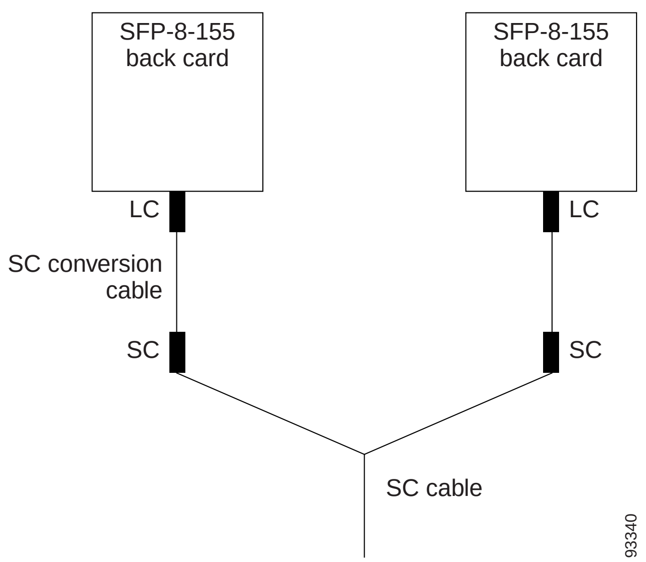
Step 2 After you have installed the first standby SFP-8-155 back card, you need to install the SC conversion cable or cables into the appropriate FRU or FRUS. Connect the LC end of the cable into the proper FRU on the SFP-8-155 card. Connect the SC end of the cable to the end of the SC cable you disconnected from the removed PXM1E-4-155 back card. The configuration should look similar to Figure 10-2.

Figure 10-2 Standby SFP-8-155 Back Card with SC Conversion Cable



Step 3 After you have installed the second SFP-8-155 back card, install the SC conversion cable or cables into the appropriate FRU or FRUs, just as you did in Step 2. The configuration should look similar to Figure 10-3.

Figure 10-3 Both SFP-8-155 Back Cards with SC Conversion Cables



If the upgraded SFP-8-155 back cards connect to CPE that is already using LC cables, you still need to use SC conversion cables. Without the SC conversion cables, you can not do a graceful upgrade and traffic will be interrupted. This is because the CPE at the other end of the original SC connection has an LC to SC conversion cable. If you want to upgrade to a straight LC cable, you will have to disconnect the original SC conversion cable, and this will interrupt traffic.

Replacing PXM45/A or PXM45/B Cards with PXM45/C Cards

PXM45/A and PXM45/B front cards can be replaced with PXM45/C cards while the switch is operating. If a PXM45 is operating in standalone mode, all calls are interrupted until the PXM45 is replaced and the PXM45/C card is operating correctly. If the switch is using redundant PXM45s, enter the **switchcc** command, if necessary, to ensure that the card you want to replace is operating in standby mode. For redundant PXM45 cards, you are ready to replace the standby card as soon as the other card becomes active. You do not need to wait for the standby card to reach standby mode.

Note The PXM45/C card requires a PXM-UI-S3B back card. The PXM45/C will not run with the PXM-UI-S3 back card.

Note Before replacing PXM45 cards with PXM45/C cards, you need to upgrade all cards on the switch to Release 4 or later.

Note If you are running CWM on your switch, you must upgrade CWM to Release 12 before replacing PXM45 cards with PXM45/C cards.

Gracefully upgrade from a Redundant PXM45 Card Set to a Redundant PXM45/C Card Set

To gracefully upgrade from a redundant PXM45 card set to a redundant PXM45/C card set, use the following procedure:

Step 1 Enter the **dspcds** command to verify that the current PXM45 card is running Release 4 or later.

Step 2 If you are running CWM on your network, ensure that all workstations are running CWM Release 12.

Step 3 Enter the **saveallcnf** command to save the existing configuration on the current PXM45 card, and FTP that configuration file to a remote location. This ensures that you will be able to go back to your old switch configuration if you need to.

Step 4 Physically remove the standby PXM45 card set (front and back cards) from the switch on which you are performing the upgrade, and replace it with the PXM45/C card set. Replace the back cards before replacing the front cards.

Step 5 Log into the switch and configure boot parameters on the new PXM45/C card.

Step 6 Enter the **dspcds** command and verify that the PXM45/C comes up in the standby-ready state.

Step 7 Enter the **switchcc** command to witch the roles of the active and standby cards so you can upgrade the non-upgraded card in standby mode. The PXM45/C now becomes the active card, and the PXM45 becomes the standby card.

Step 8 Enter the **dspcds** command to verify that the PXM45/C comes up in the active-ready state.

Step 9 Physically remove the standby PXM45 from the switch on which you are performing the upgrade, and replace it with the PXM45/C.

Step 10 Enter the **dspcds** command and verify that the standby PXM45/C comes up in the standby-ready state.

Non-gracefully Upgrade a Single PXM45 to a PXM45/C

To non-gracefully upgrade from a single PXM45 to a PXM45/C, use the following procedure:

Step 1 Enter the **dspcds** command to verify that the current PXM45 card is running Release 4 or later.

Step 2 If you are running CWM on your network, ensure that all workstations are running CWM Release 12.

Step 3 Enter the **saveallcnf** command to save the existing configuration on the current PXM45 card, and FTP that configuration file to a remote location. This ensures that you will be able to go back to your old switch configuration if you need to.

Step 4 Physically remove the PXM45 card set (front and back cards) from the switch on which you are performing the upgrade, and replace it with the PXM45/C card set.

Step 5 Log into the switch and configure boot parameters on the new PXM45/C card.

Step 6 Enter the **dspcds** command to verify that the PXM45/C comes up in the active-ready state.

Step 7 FTP the original PXM45 configuration file onto current switch. This is the file that you saved to a remote location in Step 2.

Step 8 Enter the **restoreallcnf** command to restore the old configurations on the current switch.

Step 9 Enter the **dspcd** <*slotnumber*> command to verify that the reserved front card is a PXM45/C. Replace <*slotnumber*> with the slot number of the active PXM45 card.

After you replace the PXM45 card, enter the **dspcd** or **dsprev** command to view the boot software version. If the boot software version is not correct for your switch, upgrade it as described in Appendix A, "Downloading and Installing Software Upgrades."

Note When replacing PXM45 cards with PXM45/C cards, the switch performs the same nativity check described earlier in this chapter.

Replacing AXSM Cards with AXSM/B Cards

You can replace AXSM cards with AXSM/B cards of the same type. For example, you can replace an AXSM-4-622 with and AXSM-4-622/B. The following sections describe these upgrade scenarios:

- Upgrading a standalone AXSM
- Upgrading an AXSM in a redundant card set

Upgrading a Standalone AXSM

You can upgrade a standalone AXSM, but all communications are interrupted during the upgrade.

Tip To avoid interrupting communications, consider installing a redundant AXSM card. You can then upgrade the AXSM using the procedure for a redundant card set.

To upgrade a standalone AXSM, use the following procedure.

Step 1 Determine if you need to upgrade the AXSM runtime software before or after the hardware upgrade. For information on the runtime software required, refer to the *Release Notes for Cisco MGX 8850 (PXM1E/PXM45), Cisco MGX 8950, and Cisco MGX 8830 Switches, Release 5.0.00* or the *Release Notes for the Cisco MGX 8880 Media Gateway, Release 5.0.00*.

Step 2 Replace the standby AXSM with the AXSM/B card.

Note When replacing OC-3, OC-12, and OC-48 versions of the AXSM, you might need to change the back cards to /B versions. To determine which back cards need to be replaced, refer to the row in Table 2-9 that applies to the new AXSM/B card you are installing.

The configuration for AXSM cards is stored on the PXM45. The switch will configure the new AXSM/B card and bring it up in active mode.

Step 3 Enter the **dspcd** or **dsprev** command to verify that the AXSM/B card is using the correct boot software version.

Note The switch automatically selects and loads the correct runtime software for the AXSM based on the configuration for that slot. The switch does not automatically burn boot code for an AXSM. For instructions on upgrading boot code, see Appendix A, "Downloading and Installing Software Upgrades."

If intracard APS is not configured on the card before the upgrade, the card will function as an AXSM/B card.

If intracard APS is configured, the card will operate as an AXSM card. To upgrade to the AXSM/B operating mode, you must enter the **enableaxsmbaps** command at the PXM. Once the AXSM/B starts operating in AXSM/B mode, the card can no longer return to AXSM operating mode.

Upgrading an AXSM in a Redundant Card Set

When upgrading a redundant AXSM card set, you can complete the upgrade without interrupting established calls by using the following procedure.

Step 1 Determine if you need to upgrade the AXSM runtime software before or after the hardware upgrade. For information on the runtime software required, refer to the *Release Notes for Cisco MGX 8850 (PXM1E/PXM45), Cisco MGX 8950, and Cisco MGX 8830 Switches, Release 5.0.00* or the *Release Notes for the Cisco MGX 8880 Media Gateway, Release 5.0.00*.

Step 2 Use the **switchredcd** command as necessary so that the AXSM card to be replaced is operating in standby mode.

Step 3 Replace the standby AXSM with the AXSM/B card.

Note When replacing OC-3, OC-12, and OC-48 versions of the AXSM, you might need to change the back cards to /B versions. To determine which back cards need to be replaced, refer to the row in Table 2-9 that applies to the new AXSM/B card you are installing.

The configuration for AXSM cards is stored on the PXM45. The switch will configure the new AXSM/B card and bring it up in standby mode. In standby mode, the card will operate as an AXSM/A card.

Step 4 Enter the **dspcd** or **dsprev** command to verify that the AXSM/B card is using the correct boot software version.

Note The switch automatically selects and loads the correct runtime software for the AXSM based on the configuration for that slot. The switch does not automatically burn boot code for an AXSM. For instructions on upgrading boot code, see Appendix A, "Downloading and Installing Software Upgrades."

Step 5 If you need to replace both AXSM cards in the redundant pair, repeat Steps 1 through 4 for the other card.

Step 6 When both cards have been upgraded to AXSM/B cards, enter the **enableaxsmbaps** command at the PXM prompt.

This step causes the redundant AXSM/B cards to stop emulating AXSM cards and operate as AXSM/B cards. Once the AXSM/B cards start operating in as AXSM/B card, the cards can no longer return to AXSM operating mode.

Replacing Service Modules

The procedure you use for replacing a service module depends on whether you are replacing the service module with the same type of service module or with a different type. The following sections describe the following procedures:

- Replacing Service Modules with the Same Type of Service Module
- Replacing Eight-Port T1 and E1 Service Modules with MPSM-8-T1E1
- Replacing Service Modules with a Different Type of Service Module

Replacing Service Modules with the Same Type of Service Module

If a service module front or back card fails, remove the old card and insert a new card of the same type in the same slot. If the card is a standalone card, all communications are interrupted. If the card is part of a redundant card set, you can replace the standby card without disrupting traffic through the active card.

The configuration for each service module is stored on the PXM. The switch automatically configures the replacement service module and starts it up. If the card is a standalone card, the card will start up as an active card. If the card is part of a redundant pair, the card will start up in standby mode.

Note The switch automatically selects and loads the correct runtime software for a service module based on the configuration for that slot. The switch does not automatically burn the boot code for a service module.

Replacing Eight-Port T1 and E1 Service Modules with MPSM-8-T1E1

The MPSM-8-T1E1 card is designed to replace older eight-port T1 and E1 service modules designed to provide ATM, circuit emulation, and Frame Relay services. The following sections list the cards that can be upgraded to MPSM-8-T1E1 and the procedures for upgrading cards that are operating in standalone and redundant configurations.

Service Modules that Can Be Upgraded to MPSM-8-T1E1

The following service modules can be upgraded to or replaced with MPSM-8-T1E1:

- AUSM8E1/B
- AUSM8T1/B
- CESM-8E1
- CESM-8T1
- CESM-8T1/B (provided that the single timeslot multiframe capabilities are not being used)
- FRSM-8E1
- FRSM-8E1-C
- FRSM-8T1
- FRSM-8T1-C

Note There are feature differences between the service modules listed above and the MPSM-8-T1E1. For more information, refer to the appropriate service module configuration guide, all of which are listed in Table 1-1.

Upgrading Standalone Configurations

When upgrading a standalone service module to MPSM-8-T1E1, you must upgrade both the software and the hardware. The software configuration and feature licenses remain intact during the upgrade, but all active connections are terminated.

Tip To avoid service interruption for standalone service modules, configure card redundancy and use the procedure in the “Replacing a Primary Card in a Redundancy Group” section that follows this section.

Step 1 If you have not done so already, upgrade the PXM software to a version that supports the MPSM software you will be using. For more information, refer to the *Release Notes for Cisco MGX 8850 (PXM1E/PXM45), Cisco MGX 8950, and Cisco MGX 8830 Switches, Release 5.0.00*.

Step 2 If you have not done so already, copy the MPSM runtime software to the switch as described in the “Copying Software Files to the Switch” section in Appendix A, “Downloading and Installing Software Upgrades.”

MPSM runtime files are named using the following format: mpsm_t1e1_030.000.000.000.fw. The numerals in the file name indicate the software version as described in “Determining the Software Version Number from Filenames” in Chapter 9, “Switch Operating Procedures.”

Step 3 Establish a configuration session using a user name with SERVICE_GP privileges or higher.

Step 4 Use the **loadrev** command to prepare the standalone service module slot for the MPSM software. The command format is:

```
M8850_SF.7.PXM.a > loadrev <slotNo> <mpsm-rev> mpsm
```

Replace the *slotNo* variable with the slot number for the legacy service module, and replace the *mpsm-rev* variable with the version number of the MPSM software. For information on determining the software version number using the filename, see "Determining the Software Version Number from Filenames" in Chapter 9, "Switch Operating Procedures."

The **mpsm** parameter is required to enable loading of MPSM software for a slot that is configured for another type of card. The following example shows how this command is used:

```
M8850_SF.7.PXM.a > loadrev 13 30.0(0.85)A mpsm
one or more card(s) in the logical slot may be reset.
loadrev: Do you want to proceed (Yes/No)? y
```

Step 5 Use the **runrev** command to configure the standalone service module slot to run the MPSM software. The command format is:

```
M8850_SF.7.PXM.a > runrev <slotNo> <mpsm-rev> mpsm
```

Replace the *slotNo* variable with the slot number for the legacy service module, and replace the *mpsm-rev* variable with the version number of the MPSM software. The version number is the same number used with the **loadrev** command.

Again, the **mpsm** parameter is required to enable the operation of MPSM software for a slot that is configured for another type of card. The following example shows how this command is used:

```
M8850_SF.7.PXM.a > runrev 13 30.0(0.85)A mpsm
one or more card(s) in the logical slot may be reset.
runrev: Do you want to proceed (Yes/No)? y
```

After you enter the **runrev** command, the standalone service module will reset and the card state, which you can view with the **dspcds** command, will change to *mismatch*.

Step 6 Remove the standalone service module from the slot you have prepared for the MPSM.

Step 7 Insert the MPSM-8-T1E1 card in the slot used in the previous steps.

The MPSM-8-T1E1 will cycle through the *Boot*, *Init*, and *Standby* states, and become *Active*. If the software version specified in the **loadrev** and **runrev** commands is already stored in the flash memory on the MPSM, this process is faster than the start up time for the replaced service module. If the software version isn't in flash, it must be downloaded from the PXM and the bring up time will be about the same as for the replaced service module.

Step 8 To finalize the upgrade, enter the **commitrev** command. The command format is:

```
M8850_SF.7.PXM.a > commitrev <slotNo> <mpsm-rev>
```

Use the same slot number and revision number used in the previous steps. For example:

```
M8850_SF.7.PXM.a > commitrev 13 30.0(0.85)A
```

Replacing the Secondary Card in a Redundancy Group

When upgrading the secondary card in a redundant service module configuration to MPSM-8-T1E1, you must upgrade both the software and the hardware. The software configuration and feature licenses remain intact during the upgrade, but there is no redundancy protection for primary cards during the upgrade.

The following procedure describes how to upgrade the secondary card in a redundant configuration to MPSM-8-T1E1.

Step 1 If you have not done so already, upgrade the PXM software to a version that supports the MPSM software you will be using. For more information, refer to the *Release Notes for Cisco MGX 8850 (PXM1E/PXM45), Cisco MGX 8950, and Cisco MGX 8830 Switches, Release 5.0.00* or the *Release Notes for the Cisco MGX 8880 Media Gateway, Release 5.0.00*.

Step 2 If you have not done so already, copy the MPSM runtime software to the switch as described in the "Copying Software Files to the Switch" section in Appendix A, "Downloading and Installing Software Upgrades."

MPSM runtime files are named using the following format: mpsm_t1e1_030.000.000.000.fw. The numerals in the file name indicate the software version as described in "Determining the Software Version Number from Filenames" in Chapter 9, "Switch Operating Procedures."

Step 3 Establish a configuration session using a user name with SERVICE_GP privileges or higher.

Step 4 Remove the redundancy configuration for each primary card in the redundant group using the **delred** command. The command format is:

```
PXM1E_SJ.8.PXM.a > delred <primarSlotNo>
```

Step 5 Remove the secondary card you are replacing. This should be one of the card types listed in the "Service Modules that Can Be Upgraded to MPSM-8-T1E1" section.

Step 6 Insert a MPSM-8T1E1 in the secondary slot.

Step 7 Use the **setrev** command to initialize the MPSM card as described in the "Initializing Service Modules" section in Chapter 4, "Preparing Service Modules for Communication."

Step 8 Use the **addred** command to establish redundancy between the primary cards reconfigured in Step 4 and the new MPSM card as described in the "Establishing Redundancy Between Two Service Modules" section in Chapter 4, "Preparing Service Modules for Communication."

After redundancy has been added to all primary service modules, the redundant configuration is restored and the MPSM-8-T1E1 now serves at the secondary card for all protected cards. To upgrade primary cards to MPSM-8-T1E1, use the procedure in the next section.

Note When the primary card is not an MPSM-8-T1E1 and the primary card is running a software version released prior to Release 5.0, provisioning is blocked whenever the secondary MPSM-8-T1E1 is active. To prevent blocking provisioning, upgrade all primary cards to the latest release after upgrading the secondary card to MPSM-8-T1E1.

Replacing a Primary Card in a Redundancy Group

When upgrading the primary card in a redundant service module configuration to MPSM-8-T1E1, you must upgrade both the software and the hardware. The software configuration and feature licenses remain intact during the upgrade, but active connections are briefly interrupted when switching between primary and secondary cards.

When upgrading redundant service module configurations, keep the following in mind:

- The secondary card must be an MPSM-8-T1E1.
- If the secondary card is not an MPSM-8-T1E1, the secondary card must be upgraded before upgrading a primary card.

The following procedure describes how to upgrade a primary card in a redundant configuration to MPSM-8-T1E1.

Step 1 If you have not done so already, upgrade the secondary card to MPSM-8-T1E1 as described in the previous section.

Step 2 Establish a configuration session using a user name with SERVICE_GP privileges or higher.

Step 3 Use the **loadrev** command to prepare the primary card slot for the MPSM software. The command format is:

```
M8850_SF.7.PXM.a > loadrev <slotNo> <mpsm-rev> mpsm
```

Replace the *slotNo* variable with the slot number for the legacy service module, and replace the *mpsm-rev* variable with the version number of the MPSM software. For information on determining the software version number using the filename, see “Determining the Software Version Number from Filenames” in Chapter 9, “Switch Operating Procedures.”

The **mpsm** parameter is required to enable loading of MPSM software for a slot that is configured for a different type of card. The following example shows how this command is used:

```
M8850_SF.7.PXM.a > loadrev 13 30.0(0.85)A mpsm
one or more card(s) in the logical slot may be reset.
loadrev: Do you want to proceed (Yes/No)? y
```

Step 4 Use the **runrev** command to configure the primary card slot to run the MPSM software. The command format is:

```
M8850_SF.7.PXM.a > runrev <slotNo> <mpsm-rev> mpsm
```

Replace the *slotNo* variable with the primary card slot number, and replace the *mpsm-rev* variable with the version number of the MPSM software. The version number is the same number used with the **loadrev** command.

Again, the **mpsm** parameter is required to enable the operation of MPSM software for a slot that is configured for a different type of card. The following example shows how this command is used:

```
M8850_SF.7.PXM.a > runrev 13 30.0(0.85)A mpsm
one or more card(s) in the logical slot may be reset.
runrev: Do you want to proceed (Yes/No)? y
```

After you enter the **runrev** command, the primary card will reset and the card state, which you can view with the **dspcds** command, will change to *mismatch*. The secondary card will become active and take over the run-time operations for the primary card.

Step 5 Remove the primary card from the slot you have prepared for the MPSM.

Step 6 Insert the MPSM-8-T1E1 card in the slot used in the previous steps.

The MPSM-8-T1E1 will cycle through the *Boot* and *Init*, and enter the *Standby* state. If the software version specified in the **loadrev** and **runrev** commands is already stored in the flash memory on the MPSM, this process is faster than the start up time for previous primary card. If the software version isn’t in flash, it must be downloaded from the PXM and the bring up time will be about the same as for the previous primary card.

Step 7 To finalize the upgrade, enter the **commitrev** command. The command format is:

```
M8850_SF.7.PXM.a > commitrev <slotNo> <mpsm-rev>
```

Use the same slot number and revision number used in the previous steps. For example:

```
M8850_SF.7.PXM.a > commitrev 13 30.0(0.85)A
```

After you enter this command, the switch automatically makes the primary card active and resets the secondary card.

Replacing Service Modules with a Different Type of Service Module

To replace one type of service module front card with a different type, you must first delete the configuration for the previously installed service module. The easiest way to do this is by using the **clrsmcnf -all** command as described in the "Clearing a Slot Configuration" section of Chapter 9, "Switch Operating Procedures."

Replacing SRM Cards with SRME/B

The SRME/B card is designed to replace SRME and SRM-3T3 cards and to work with the back cards used by SRME and SRM-3T3. When upgrading SRM cards, you must upgrade both the software and the hardware. After an upgrade, the SRME/B uses the configuration previously assigned to the SRME or SRM-3T3. The following procedure describes how to replace SRM cards with SRME/B.

Step 1 If you have not done so already, upgrade the PXM software to a version that supports the SRME/B, which is Release 5.0 or later. For more information, refer to the *Release Notes for Cisco MGX 8850 (PXM1E/PXM45), Cisco MGX 8950, and Cisco MGX 8830 Switches, Release 5.0.00* or the *Release Notes for the Cisco MGX 8880 Media Gateway, Release 5.0.00*.

Step 2 If this is a redundant PXM and SRM configuration, replace the standby SRM front card with SRME/B. Otherwise, replace the standalone SRM front card.

Note If this is a standalone PXM and SRM installation, replacing the standalone SRM interrupts all SRM services.

Note The SRME/B line configuration parameters (which are used only for bulk distribution) are similar to that of the SRM-3T3, but there are some differences. Replacing a SRM-3T3 with an SRME/B sets all parameters to the defaults assigned to the SRME/B.

If this is a redundant configuration, the SRME/B will start up in standby state. If this is a standalone configuration, the SRM should come up in the active state, and the standalone replacement is complete.

Step 3 If this is a redundant configuration, use the **switchcc** command to switch control from the active PXM and SRM cards to the standby PXM and SRM cards. The new SRME/B becomes the active card and the other SRM can be replaced.

Step 4 If this is a redundant configuration, replace the current standby SRM front card with an SRME/B.

Replacing RPM Cards

If you have properly initialized an RPM card as described in the "Initializing RPM Cards" section in Chapter 6, "Preparing RPM Cards for Operation." the configuration for the RPM card is stored on the PXM hard disk.

To replace a standalone RPM card, remove the old card and insert a new card of the same type in the same slot. The switch will automatically configure the card and start it up.

Note RPM-PR and RPM-B cards are not interchangeable. When replacing an RPM-PR card, you must replace it with another RPM-PR card. If you want to change types of cards, you must first decommission the slot as described in the "Replacing PXM1E-4-155 Cards with PXM1E-8-155 Cards" section which appears later in this chapter.

To replace an RPM card that is configured for redundancy, first switch control to the standby card, then replace the card while it is operating in standby mode. If the card you are replacing has failed, there is no reason to switch cards, as the failure should have triggered a switch to the standby card. If you need to switch cards, enter the **softswitch** command as described in the "Switching Between Redundant RPM Cards" section in Chapter 9, "Switch Operating Procedures."

Note After you replace a card that is configured for redundancy, it starts up in standby mode. If the active card is configured to operate as a standby card for multiple RPM cards, enter a **softswitch** command so that the active card returns to its normal standby state.

Decommissioning an AXSM Slot

When an AXSM card is installed and configured, the configuration is associated with a specific slot number and stored on the PXM45 card. If you replace the AXSM with another card of the same type, the new card will start operating with the established configuration. Any configuration which has been used previously on that card will be discarded, because the configuration is assigned to the slot, not the physical card.

If you want to use a previously configured AXSM slot for a different type of AXSM card, you must first decommission the slot to remove the existing configuration. Otherwise, the switch will attempt to run the old configuration on the new card, and the new card will not operate correctly.

Note If you enter the **cnfpnportsig** command to change default port values, you must run the **delpnport** command to delete the port from the PXM45. If you do not run **delpnport** on the PXM45, the port will remain in a provisioning state on the PXM45.

To decommission a slot, you need to remove the existing connections, partitions, and ports as described below.

Step 1 Establish a configuration session using a user name with CISCO_GP privileges.

Step 2 Use the **cc** command to select the AXSM slot you want to decommission.

Note The AXSM card installed in the slot you are decommissioning must be the same type of card for which the slot was configured. You cannot decommission a slot with an AXSM card type that does not match the configured card type.

Step 3 To display the connections you need to delete, enter the following command:

```
mgx8850a.10.AXSM.a > dspcons
```

The following is a sample **dspcons** display.

```
pop20one.7.PXM.a > dspcons

Local Port         Vpi.Vci   Remote Port        Vpi.Vci    State   Owner
----------------------------+----------------------------+-------+------
10:2.2:2          100 100    Routed            100 100     FAIL        MASTER
Local  Addr: 47.00918100000000107b65f33c.0000010a1802.00
Remote Addr: 47.009181000000002a123f213f.000001011802.00\\
```

Step 4 Write down the interface, VPI, and VCI numbers for each connection. You need these numbers to complete the next step.

Step 5 Delete all connections by entering the following command for each connection:

```
mgx8850a.10.AXSM.a > delcon <ifNum> <VPI> <VCI>
```

Step 6 When all connections are deleted, bring down the interface by entering the following command:

```
mgx8850a.10.AXSM.a > dnport <ifNum>
```

Step 7 To display a list showing the partitions for this card, enter the **dspparts** command.

Step 8 Write down the interface number and partition number for each partition on the card. You will need this information to complete the next step.

Step 9 Delete all resource partitions by entering the following command for each resource partition:

```
mgx8850a.10.AXSM.a > delpart <ifNum> <partId>
```

Replace *ifnum* with the interface number of the port, and replace *partitionID* with the partition number assigned to the port.

Step 10 To verify that the partitions have been deleted, enter the **dspparts** command.

Step 11 To display a list showing the ports configured for this card, enter the **dspports** command.

Step 12 Write down the interface number for each port on the card. You need this information to complete the next step.

Step 13 Delete all ports by entering the following command for each port:

```
mgx8850a.10.AXSM.a > delport <ifNum> <partId>
```

Replace *ifnum* with the interface number of the port.

Step 14 To verify that the ports have been deleted, enter the **dspports** command.

Step 15 To display a list showing the lines that are administratively up, enter the **dsplns** command.

Step 16 Write down the line number for each line that is up. You need will this information to complete the next step.

Step 17 Bring down all lines by entering the following command for each line:

```
mgx8850a.10.AXSM.a > dnln <bay.line>
```

Step 18 To verify that the lines have been brought down, enter the **dsplns** command.

When all lines have been brought down, the slot is decommissioned and you can add an AXSM card of a different type in that slot as described in "Adding Service Modules," which appears earlier in this chapter.

Decommissioning an RPM Slot

To decommission an RPM slot, you must remove all configuration items configured for that card. You can do this by entering each command in the startup-config file with the key word **no** in front of it. These configuration items are described in the *Cisco MGX Route Processor Module (RPM-PR) Installation and Configuration Guide, Release 2.1* and *Cisco MGX Route Processor Module (RPM-XF) Installation and Configuration Guide, Release 4*.

CHAPTER 11

Viewing and Responding to Alarms

Cisco MGX switches display alarm information about the switch cards and store this information inside the switch. This chapter describes how to interpret the alarm LEDs on the switch and how to obtain alarm reports through the CLI.

Viewing and Responding to Alarms Using Physical Switch Controls

All cards have LEDs for viewing alarm status and switches for responding to alarms. The "Illustrated Card List" chapter in the *Cisco MGX 8850 (PXM1E/PXM45), Cisco MGX 8950, Cisco MGX 8830, and Cisco MGX 8880 Hardware Installation Guide, Releases 2 Through 5* describes the LEDs for all cards that can be installed in the Cisco MGX 8850 (PXM1E/PXM45), Cisco MGX 8950, and Cisco MGX 8830 switches.

Note Although there are LEDs for critical, major, and minor alarms on the PXM45 and PXM1E cards, only one of these LEDs is set to "on" when multiple alarms are active. The switch always displays the status of the most severe alarm. Critical alarms are the most severe, and minor alarms are the least severe. If there were 2 major alarms and 10 minor alarms, the switch would set the major alarm LED to on.

Displaying Alarm Reports in the CLI

You can use a CLI session to view the status of node alarms. Alarms are reported in the following categories:

- Node alarms
- Clock alarms
- Switching alarms (On Cisco MGX 8850 (PXM45) and Cisco MGX 8950 switches only)
- Environment alarms
- Card alarms
- License alarms

The sections that follow describe how to display the different types of alarm reports.

Note The procedures in the following sections can be completed by users at all access levels.

Displaying Node Alarms

A node alarm report displays a summary report of all alarms on the node. To display node alarms, enter the following command:

```
M8830_CH.1.PXM.a > dspndalms
```

The following example shows the node alarm report display.

```
M8830_CH.1.PXM.a > dspndalms
Node Alarm Summary

Alarm Type                    Critical       Major         Minor
----------                    --------      -------       -------
Clock Alarms                        0            0             0
Switching Alarms                    0            0             0
Environment Alarms                  0            0             0
Card Alarms                         3            2             0
Node License Alarm                  0            0             0
```

Typically, you would start investigating alarms by displaying the node alarms. Once you have identified the area that is producing the alarms, you would enter additional commands to display detailed information on those alarms. The following sections describe how to display these detailed reports.

Displaying Clock Alarms

Cisco MGX switches monitor the quality of the clock sources. If the timing for a clock source strays beyond the tolerance thresholds, an alarm is reported. To view the clock alarms, enter the following command:

```
mgx8850a.2.PXM.a> dspclkalms
```

The following is an example clock alarm report:

```
mgx8850a.2.PXM.a> dspclkalms
mgx8850a                          System Rev: 03.00   May. 06, 2002 22:47:36 GMT
MGX8830                                                  Node Alarm: MINOR
Clock Manager Alarm Summary
----------------------------
NETWORK CLOCK ALARM : STANDBY LOST PRIMARY REFERENCE : MINOR
NETWORK CLOCK ALARM : STANDBY LOST SECONDARY REFERENCE : MINOR
Critical       Major          Minor
000            000            002
```

Displaying Switching Alarms

Switching alarms identify problems with the switching components within the switch. Cisco MGX 8850 (PXM45) and Cisco MGX 8950 support several commands that allow you to display switching alarms.

Note PXM1E do not support switching alarms. Therefore, the commands in this section do not apply to Cisco MGX 8850 (PXM1E) and Cisco MGX 8830 switches.

To display a report of all switching alarms, enter the following command:

```
M8850_LA.8.PXM.a > dspswalms
```

The following example is a sample report showing no switching alarms.

```
M8850_LA.8.PXM.a > dspswalms

             XBAR SWITCHING FABRIC ALARMS SUMMARY

            Xbar Core Alarm        Xbar Port Alarm     Xbar Slot B/W alarm
Slot No.  Critical Major Minor   Critical Major Minor  Critical Major Minor
-------   -------- ----- -----   -------- ----- -----  -------- ----- -----
  01           0      0     0        0      0     0        0      0     0
  02           0      0     0        0      0     0        0      0     0
  03           0      0     0        0      0     0        0      0     0
  04           0      0     0        0      0     0        0      0     0
  05           0      0     0        0      0     0        0      0     0
  06           0      0     0        0      0     0        0      0     0
  07          --     --    --       --     --    --       --     --    --
  08           0      0     0        0      0     0        0      0     0
  09          --     --    --       --     --    --       --     --    --
  10           0      0     0        0      0     0        0      0     0
  11           0      0     0        0      0     0        0      0     0
  12           0      0     0        0      0     0        0      0     0
  13          --     --    --       --     --    --       --     --    --
  14          --     --    --       --     --    --       --     --    --
```

To display additional information on switch alarms, enter the following commands:

- **dspXbarPlaneAlms**
- **dspxbarslotbwalms**

To display a report for xbar alarms, enter the following command:

```
M8850_NY.7.PXM.a > dspdevalms XBARCORE -pslot *
```

The following display is an example xbar alarm report.

```
M8850_LA.8.PXM.a > dspdevalms XBARCORE -pslot *
M8850_LA                         System Rev: 05.00   Apr. 13, 2004 18:24:37 GMT
MGX8850                                              Node Alarm: MAJOR

             XBAR CORE ALARM SEVERITY INFO SUMMARY
                   Fabric Slot / Plane
Slot   7/0   7/1   7/2     8/0   8/1   8/2
----   ----  ----  ----    ----  ----  ----
 01    --    --    --      --    --    --
 02    --    --    --      --    --    --
 03    --    --    --      --    --    --
 04    --    --    --      --    --    --
 05    --    --    --      --    --    --
 06    --    --    --      --    --    --
 07    --    --    --      --    --    --
 08    --    --    --      --    --    --
 09    --    --    --      --    --    --
 10    --    --    --      --    --    --
 11    --    --    --      --    --    --
 12    --    --    --      --    --    --
 13    --    --    --      --    --    --
 14    --    --    --      --    --    --
```

When the switch reports xbar alarms, you can use the troubleshooting commands in Table 11-1 to collect more information.

Table 11-1 Crossbar Alarm Troubleshooting Commands

Command	Purpose
dspxbar <*slot*> <*plane*>	Displays the following general information about the configuration of a switch plane (or switching fabric or crossbar): • Number of the slot where the crossbar ASIC resides (7 or 8 for a Cisco MGX 8850 (PXM1E) node, 9, 10, 25, or 26 for a Cisco MGX 8950 node). • Selected switch plane or ASIC number. The range is 0 to 3. If you do not specify a plane with this command, the default value of 0 is used. • Revision number of the ASIC. • Status of the ASIC.The status is either failed or OK. If the status is failed, the other ASICs must carry the switching load, and the throughput of the switch falls below the maximum. In this case, Cisco Systems recommends you replace the card. The cell grant mode is always “Multicast Preferred.” • The “Resent Sframe Tic” is the rising edge of the clock. “Sframe” refers to a switch frame.
dspdeverrhist XBARCORE -pslot *	Displays a historical count of errors.
dspdeverr XBARCORE -pslot *	Displays the current count of errors.

Table 11-1 Crossbar Alarm Troubleshooting Commands (continued)

Command	Purpose
dspxbarerrthresh	Displays the thresholds for crossbar errors. The following items that make up a threshold are as follows: • Duration of the error state • Number of errors during that time period • Upper and lower error counts within a particular alarm severity (minor, major, and critical) Thresholds are displayed for the following errors: • Loss of synchronization (LossOfSync) • Transceiver error (TranscieverErr) • DisparityErr—an accumulation of five ASIC-level errors • ParityErr—a parity error in the switch frame as a whole • HeaderCRCErr—a CRC error for the switch frame header • PayloadCRCErr—a CRC error for the switch frame payload • RemapTwiceErr • RemapRecurrErr • Backpressure parity error (B.P.ParityErr)—a parity error in the signaling for backpressure
dspxbarmgmt	Displays details about the load sharing configuration for the node.
dspxbarstatus	Displays status of each slot for a crossbar.

For more information on these commands, refer to the *Cisco MGX 8850 (PXM45/PXM1E), Cisco MGX 8950, Cisco MGX 8830, and Cisco MGX 8880 Command Reference, Release 5*.

Displaying Environment Alarms

An environmental alarm report displays the alarm status and operating statistics for the switch power supplies and cooling fans. To display the environmental alarm report, enter the **dspenvalms** command as shown in the following example:

```
mgx8830a.2.PXM.a > dspenvalms

Type <CR> to continue, Q<CR> to stop:
mgx8830a                         System Rev: 03.00   May 06, 2002 23:40:57 GMT
MGX8830                                              Node Alarm: MINOR
ENVIRONMENTAL ALARM STATE INFO   ^Notification Disabled
   Alarm Type      Unit   Threshold      DataType   Value       State
 ----------------  ---- --------------   -------- ---------- -------------
 Top Fan Tray       6    >= 2000          RPM       3654     Normal
 Top Fan Tray       7    >= 2000          RPM       3576     Normal
 Top Fan Tray       8    >= 2000          RPM       3468     Normal
 Top Fan Tray       9    >= 2000          RPM       3492     Normal
```

```
 Bottom Fan Tray    1    >= 2000          RPM       0        Missing
 Bottom Fan Tray    2    >= 2000          RPM       0        Missing
 Bottom Fan Tray    3    >= 2000          RPM       0        Missing
 Bottom Fan Tray    4    >= 2000          RPM       0        Missing
 Bottom Fan Tray    5    >= 2000          RPM       0        Missing
 Bottom Fan Tray    6    >= 2000          RPM       0        Missing
 Bottom Fan Tray    7    >= 2000          RPM       0        Missing
 Bottom Fan Tray    8    >= 2000          RPM       0        Missing
 Bottom Fan Tray    9    >= 2000          RPM       0        Missing

 +5V Input             4.850^ to 5.150^   VoltsDC   5.036    Informational
 +3.3V Input           3.200^ to 3.400^   VoltsDC   3.298    Informational

Type <CR> to continue, Q<CR> to stop:
MGX8830                                              Node Alarm: MINOR
ENVIRONMENTAL ALARM STATE INFO   ^Notification Disabled
   Alarm Type      Unit   Threshold      DataType   Value       State
 ----------------  ---- --------------   -------- ---------- -------------
 Fan Tray           6    >= 2000          RPM       2766     Normal
 Fan Tray           7    >= 2000          RPM       2676     Normal
 Fan Tray           8    >= 2000          RPM       2610     Normal

 +5V Input             4.850^ to 5.150^   VoltsDC   4.997    Informational
 +3.3V Input           3.200^ to 3.400^   VoltsDC   3.259    Informational
 Calibration VDC        0x7e^ to 0x82^    Other     0x80     Informationall
```

Displaying Card Alarms

A card alarm report can display the alarm status of all the cards within the node or the alarm status of a single card. To display card alarms, enter the following command at the PXM45 or PXM1E switch prompt:

mgx8830a.2.PXM.a> **dspcdalms** [*slot*]

Replace [*slot*] with the number of the card for which you want to display alarms. If you omit the slot number, the switch displays the alarms for all cards in the node as shown in the following example:

```
M8830_CH.1.PXM.a > dspcdalms
Card Alarm Summary

Slot  Critical   Major     Minor   ||  Slot  Critical   Major     Minor
----  --------  -------   -------  ||  ----  --------  -------   -------
 1          1        0         0   ||    8         0        0         0
 2          0        0         0   ||    9         0        0         0
 3          0        0         0   ||   10         0        0         0
 4          0        0         0   ||   11         0        0         0
 5          0        0         0   ||   12         2        2         0
 6          0        0         0   ||   13         0        0         0
 7          0        0         0   ||   14         0        0         0

Use dspcdalms <slot> to see more detail.
```

The next example shows a card alarm report for an MPSM-T3E3-155 card in slot 12:

```
M8830_CH.1.PXM.a > dspcdalms 12
Card Alarm Summary


Alarm Type                     Critical       Major          Minor
----------                     --------      -------        -------
Hardware Alarm                        0            0              0
Card State Alarm                      0            0              0
Disk Alarm                            0            0              0
Diag Alarm                            0            0              0
License Alarm                         0            0              0
Resource Alarm                        0            0              0
SRM Alarm                             0            0              0
IMA Alarm                             0            0              0
Line Alarm                            0            0              0
Path Alarm                            2            0              0
Port Alarm                            0            0              0
LMI Alarm                             0            0              0
Channel Alarm                         0            2              0
SAR Alarm                             0            0              0
```

Table 11-2 lists commands that you can enter to display additional information about alarms that appear in the **dspcdalms** report.

Table 11-2 Card Alarm Information Commands

Alarm Type	Commands
Hardware	**dspHwAlms**
Card state	**dspcd** <slot>
License	**dsplicalms**
Resource	**dsprmalms**
IMA	**dspimagrpalms** **dspimalnkalms**
Feeder	**dspfdrs** **dspfdr**
Line	**dspalms** **dsplns** **dspln** **dspapslns** **dspapsln**
Port	**dspports** **dsppnports**
Channel or Connection	**dspconalarms** **dspcons** **dspcon**
SAR	**dspsaralms**

Displaying Line Alarms on Service Modules

The service modules generate line alarms when a loss of signal (LOS) alarm occurs.

Table 11-3 lists commands that you can enter to display information about line alarms on service modules.

Table 11-3 Line Alarm Information Commands

Alarm Type	Description
dspalm	Display the active alarms associated with a specific line on the current service module. Enter the command without parameters to view the command syntax.
dspalmcnf	Display the alarm configuration and thresholds for a specific line on the current service module. Enter the command without parameters to view the command syntax.
dspalmcnt	Display the alarm counters for a line on the current service module. The alarm counters indicate how many times each type of active alarm has occurred since the counters were last reset. Enter the command without parameters to view the command syntax.
dspalms	Display a summary of the active line alarms on the current service module. This command does not require parameters.

For detailed information about line alarms on specific service modules, refer to that service module's configuration guide. The service module configuration guides are listed in Table 1-1.

Displaying IMA Alarms

Enter the **dspimagrpalms** command to display alarm state information for all IMA groups on the current PXM1E-16-T1E1 or AXSM-32-T1E1-E, as shown in the following example:

```
 Unknown.7.PXM.a > dspimagrpalms

Group  Number                : 2.1
Alarm  State                 : StartUp Fe

Group  Number                : 2.2
Alarm  State                 : Other Failure
```

Enter the **dspimagrpalm** <*bay.group*> command to display alarm state information for a specific IMA group. Replace bay with the number *1* to specify the lower bay, or *2* to specify the lower bay. Replace *group* with the IMA group whose alarm status you want to view.

In the following example, the user displays alarm information for the IMA group 2 in the lower bay.

```
 Unknown.7.PXM.a > dspimagrpalm 2.2

Group  Number                : 2.2
Alarm  State                 : Other Failure
```

Enter the **dspimalnkalms** command to display alarm state information for all IMA links on the current PXM1E-16-T1E1 or AXSM-32-T1E1-E, as shown in the following example.

```
Unknown.7.PXM.a > dspimalnkalms

Link  Number           : 2.5
Alarm State            : Lif Fail
```

Enter the **dspimalnkalm** <*bay.line*> command to display alarm state information for a specific IMA link. Replace bay with the 2 to specify the lower bay. Replace *line* with number of the line whose alarm status you want to view.

Note On the PXM1E, the bay number is always 2.

In the following example, the user displays alarm information for the IMA group 5 in the lower bay.

```
Unknown.7.PXM.a > dspimalnkalm 2.5
Link  Number           : 2.5
Alarm State            : Lif Fail
```

Note The commands in this section apply to the AXSM-32-T1E1-E and the PXM1E-16-T1E1 only. For information on the commands used to display alarms on AUSM-8-T1E1/B cards, refer to the *Cisco ATM Services (AUSM/MPSM) Configuration Guide and Command Reference for MGX Switches, Release 5*.

Displaying License Alarms

Enter the **dsplicalms** command to display alarm state information for MPSM feature licenses. For example:

```
M8830_CH.1.PXM.a > dsplicalms
M8830_CH                         System Rev: 04.09   Mar. 08, 2004 09:31:25 GMT
MGX8830                                              Node Alarm: CRITICAL
Slot  Critical   Major     Minor   ||  Slot  Critical   Major     Minor
----  --------  -------   -------  ||  ----  --------  -------   -------
 1          0        0          0  ||    8          0        0          0
 2          0        0          0  ||    9          0        0          0
 3          0        0          0  ||   10          0        0          0
 4          0        0          0  ||   11          0        0          0
 5          0        0          0  ||   12          0        0          0
 6          0        0          0  ||   13          0        0          0
 7          0        0          0  ||   14          0        0          0
```

To display license information on all cards, enter the **dspliccds** command as shown in the following example:

```
M8830_CH.1.PXM.a > dspliccds
M8830_CH                        System Rev: 04.09   Mar. 08, 2004 09:33:59 GMT
MGX8830                                             Node Alarm: CRITICAL
                        Card Lic  Prov     License      Allocated
Slot  Card Type         Alarm     Allowed  Type         Licenses
----  ----------------  --------  -------  -----------  ---------
3     --                --        --       --           0
4     --                --        --       --           0
5     --                --        --       --           0
6     --                --        --       --           0
7     --                --        --       --           0
8     --                --        --       --           0
9     --                --        --       --           0
10    --                --        --       --           0
11    --                --        --       --           0
12    MPSM-T3E3-155     No        Yes      MultiSrvc    1
                                           Channelize   1
                                           RateControl  1
13    --                --        --       --           0
14    --                --        --       --           0
```

To display license information on a specific card, enter the **dspliccd** command as shown in the following example:

```
M8830_CH.1.PXM.a > dspliccd 12
M8830_CH                        System Rev: 04.09   Mar. 08, 2004 09:34:12 GMT
MGX8830                                             Node Alarm: CRITICAL
Card License Alarm:            None
Service Module Type:           MPSM-T3E3-155
Service Module Serial Number:  SAD073504CT
Provisioning Allowed:          Yes

=========================================================
Allocated License Type      Quantity
--------------------        --------
MultiSrvc                   1
Channelize                  1
RateControl                 1

=========================================================
Programmed License Type     Quantity
--------------------        --------

=========================================================
Programmed License Registered          : N/A
License Registeration Node             : --
License Registeration Chassis Serial No: --
```

Displaying Log File Information

Log files record switch events such as operator login and command entry. To view the contents of the current log, enter the following command at the PXM1E or PXM45 switch prompt:

```
mgx8830a.2.PXM.a> dsplog [-log <number>] [-mod moduleName] [-sev <number>] [-sl <slot>]
[-task <taskName>] [-tge <MM/DD/YYYY-HH:MM:SS>] [-tle <MM/DD/YYYY-HH:MM:SS>]
```

To display a list of archived log files, enter the following command:

```
mgx8830a.2.PXM.a> dsplogs
```

The log files are stored in the C:/LOG directory.

APPENDIX A

Downloading and Installing Software Upgrades

This appendix describes how to locate, download, and install software updates for the switch. Because software updates are stored in the switch file system, this appendix includes a section on browsing the file system. This appendix includes the following sections:

- Upgrade Process Overview
- Quickstart Procedures for Software Upgrades
- Quickstart Procedures for Software Downgrades
- Browsing the File System
- Locating Software Updates
- Copying Software Files to the Switch
- Upgrade Procedures for PXM Cards and Service Modules
- Upgrade Procedures for RPM-PR and RPM-XF Cards
- Troubleshooting Upgrade Problems

Upgrade Process Overview

This appendix provides a series of quickstart procedures that describe how to perform graceful and non-graceful upgrades to the switch. To perform a graceful upgrade on a switch card, the card must be operating in redundant mode with another switch card of the same type. When performed properly, graceful upgrades have minimal impact on connections in progress and do not interrupt any established connections.

Note Graceful upgrades to Release 5.0 are supported from Release 3.0.25 and later. If you are running a release prior to Release 3.0.25, you must upgrade to Release 3.0.25 before you can upgrade to Release 5.0.

When a card to be upgraded is not operating in redundant mode, you must complete a non-graceful upgrade, which disrupts all traffic that passes through the card. For PXM cards, an ungraceful upgrade interrupts all traffic passing through the switch. For all other types of cards, an ungraceful upgrade affects only the traffic that passes through that card.

When you upgrade the software in a switch, you should refer to the *Release Notes for Cisco MGX 8850 (PXM1E/PXM45), Cisco MGX 8950, and Cisco MGX 8830 Switches, Release 5.0.00* and the *Release Notes for the Cisco MGX 8880 Media Gateway, Release 5.0.00* for the latest information. Each type of switch card runs boot and runtime software. The recommended sequence for upgrading the software on switch cards is as follows:

1. boot software
2. runtime software

Note If you plan to upgrade PXM cards and service modules, upgrade the PXM cards first. Wait until the PXM cards are operating in active and standby modes with the correct software before upgrading service modules.

Note You do not need to upgrade any software on SRM cards.

Typically, the boot software requires less frequent upgrades. Some upgrades might only require updates to one type of switch card. The *Release Notes for Cisco MGX 8850 (PXM1E/PXM45), Cisco MGX 8950, and Cisco MGX 8830 Switches, Release 5.0.00* and the *Release Notes for the Cisco MGX 8880 Media Gateway, Release 5.0.00* should explain which software components require upgrading.

When you upgrade the software on a switch card, proceed as follows:

- Decide whether you are performing a graceful or non-graceful upgrade
- Follow the appropriate quickstart procedure for that type of upgrade
- For additional information on a task within a quickstart procedure, see the appendix section to which the procedure refers

The next section presents the quickstart procedure for switch card software upgrades.

Quickstart Procedures for Software Upgrades

The following sections provide quickstart procedures for the following upgrades:

- Graceful PXM Boot Upgrades from Releases Prior to Release 3.0.10
- Graceful PXM Boot Upgrades from Release 3.0.10 and Later
- Non-Graceful PXM Boot Upgrades
- Graceful PXM and Service Module Runtime Software Upgrades
- Non-Graceful PXM and Service Module Runtime Software Upgrades
- Graceful Service Module Boot Software Upgrades
- Non-Graceful Service Module Boot Software Upgrades
- Graceful RPM Boot Software Upgrades
- Graceful RPM Runtime Software Upgrades
- Non-Graceful RPM Boot Software Upgrades
- Non-Graceful RPM Runtime Software Upgrades

Graceful PXM Boot Upgrades from Releases Prior to Release 3.0.10

When performed properly, graceful upgrades have minimal impact on connections in progress and do not interrupt any established connections.

All releases prior to Release 3.0.10 require entry into shellcon mode to complete a PXM boot upgrade. The PXM boot upgrade takes a little more time and a few more commands for these early releases.

Note This quickstart applies only if you are upgrading from a release prior to release 3.0.10. If you are upgrading from Release 3.0.10 or later, use the quickstart procedure in the "Graceful PXM Boot Upgrades from Release 3.0.10 and Later" section later in this chapter.

When a boot software upgrade is required, the procedure for upgrading redundant PXM cards is as follows:

1. Manually upgrade the boot software on the standby PXM.
2. Switch cards to make the upgraded standby card active.
3. After the standby card becomes the active card, manually upgrade the non-active card.

This process ensures a smooth transition to the new software and preserves all established calls. During the short period when the roles of the active and standby cards are switched, all calls that are not established are lost.

Caution Avoid making configuration changes while upgrading PXM software. Configuration changes can be lost when the PXM is reset during the upgrade.

To upgrade the boot software, use the following procedure.

	Command	Purpose
Step 1	**ftp**	Copy the boot and runtime files you want to use to the switch. See the "Copying Software Files to the Switch" section later in this appendix.
Step 2	*username* *password* **saveallcnf**	If you want to save the configuration before the upgrade, establish a CLI session with the *active* PXM card using a user name with SERVICE_GP privileges. This optional step saves the current configuration to the hard disk. see the "Saving a Configuration" section in Chapter 9, "Switch Operating Procedures."
Step 3	*username* *password*	Establish a CLI session with the *standby* PXM card using the CP port on the PXM-UI-S3 or PXM-UI-S3/B back card and a user name with CISCO_GP privileges.
Step 4	**sh** **sysBackupBoot** <**Return**> (3.0 and earlier)	Change to the PXM Backup Boot mode. Note that the software versions 3.0 and earlier require you to press **Return** during the reboot sequence to enter backup boot mode. See the "Changing to PXM Backup Boot Mode" section in Appendix B, "PXM Backup Boot Procedures."

	Command	Purpose
Step 5	**sysPxmRemove**	At the backup boot prompt, enter the **sysPxmRemove** command: This step prevents the active card from resetting the standby card while you are working with it.
Step 6	**sysFlashBootBurn** "*path/filename*" **reboot 2**[1] *username* *password* **dspcd**	Burn the boot code. Remember to enter quotation marks before and after the boot software filename, and specify the complete path. For example: `sysFlashBootBurn "C:FW/pxm1e_004.000.000.201_bt.fw"` **Note** Remember to enter quotation marks before and after the boot software filename. The filename you use depends on the release to which you are upgrading. For more information, refer to the *Release Notes for Cisco MGX 8850 (PXM1E/PXM45), Cisco MGX 8950, and Cisco MGX 8830 Switches, Release 5.0.00* and the *Release Notes for the Cisco MGX 8880 Media Gateway, Release 5.0.00*. **Caution** If the card is removed or reset, or if switch power is interrupted during the boot software upgrade, the upgrade will not complete, the card will not operate, and the card must be returned to Cisco for repair. See the "Upgrading PXM Boot Software from Releases Prior to 3.0.10" section later in this appendix.
Step 7	*username* *password*	Establish a CLI session with the *active* PXM card (which is the non-upgraded card). Use the CP port on the PXM-UI-S3 or PXM-UI-S3/B back card and a user name with CISCO_GP privileges.
Step 8	**switchcc** **y**	Switch the roles of the active and standby cards so you can upgrade the non-upgraded card in standby mode.
Step 9	**sh** **sysBackupBoot** **<Return>** (3.0 and earlier)	Change to the PXM Backup Boot mode. Note that the software versions 3.0 and earlier require you to press **Return** during the reboot sequence to enter backup boot mode. See the "Changing to PXM Backup Boot Mode" section in Appendix B, "PXM Backup Boot Procedures.".

	Command	Purpose
Step 10	**sysPxmRemove**	At the backup boot prompt, enter the **sysPxmRemove** command. This step prevents the active card from resetting the standby card while you are working with it.
Step 11	**sysFlashBootBurn** “*path/filename*” **reboot 2**[1] *username* *password* **dspcd**	Burn the boot code. For example, `sysFlashBootBurn "C:FW/pxm1e_004.000.000.201_bt.fw"` **Note** Remember to enter quotation marks before and after the boot software filename. The filename you use depends on the release to which you are upgrading. For more information, refer to the *Release Notes for Cisco MGX 8850 (PXM1E/PXM45), Cisco MGX 8950, and Cisco MGX 8830 Switches, Release 5.0.00* and the *Release Notes for the Cisco MGX 8880 Media Gateway, Release 5.0.00*. **Caution** If the card is removed or reset, or if switch power is interrupted during the boot software upgrade, the upgrade will not complete, the card will not operate, and the card must be returned to Cisco for repair. See the “Upgrading PXM Boot Software from Releases Prior to 3.0.10” section later in this appendix. Both active and standby cards should now be upgraded. The card that was active before the upgrade is now operating in standby mode.

1. Beginning with Release 4.0, you must enter **reboot 2**. For all prior releases, enter **reboot**.

Graceful PXM Boot Upgrades from Release 3.0.10 and Later

When performed properly, graceful upgrades have minimal impact on connections in progress and do not interrupt any established connections.

Beginning with Release 3.0.10, the Cisco MGX software supports the **burnboot** command for PXM boot software upgrades. If you are upgrading a Release 3.0.10 or later switch, you no longer have to enter shellcon to complete the boot upgrade. The boot upgrade is simpler and quicker in Release 3.0.10 and later.

Note This quickstart applies only if you are upgrading from Release 3.0.10 or a later release. If you are upgrading from a release prior to 3.0.10, use the quickstart procedure in the “Graceful PXM Boot Upgrades from Releases Prior to Release 3.0.10” section earlier in this chapter.

When a boot software upgrade is required, the procedure for upgrading redundant PXM card is as follows:

1. Manually upgrade the boot software on the standby PXM.
2. Switch cards to make the upgraded standby card active.
3. After the standby card becomes the active card, manually upgrade the non-active card.

This process ensures a smooth transition to the new software and preserves all established calls. During the short period when the roles of the active and standby cards are switched, all calls that are not established are lost.

Note Avoid making configuration changes while upgrading PXM software. Configuration changes can be lost when the PXM is reset during the upgrade.

To upgrade the boot software, use the following procedure.

	Command	Purpose
Step 1	**ftp**	Copy the boot and runtime files you want to use to the switch. See the "Copying Software Files to the Switch" section, which appears later in this appendix.
Step 2	*username* *password*	Establish a CLI session with the *active* PXM card using a user name with SERVICE_GP privileges or higher.
Step 3	**saveallcnf**	This optional step saves the current configuration to the hard disk. See the "Saving a Configuration" section in Chapter 9, "Switch Operating Procedures."
Step 4	**burnboot** <*slot*> <*revision*> **dspcd** <*slot*>	Burn the boot software on the standby PXM card by specifying the slot number of the standby card. For example: `M8850_LA.7.PXM.a > burnboot 8 4.0(0.201)` **Caution** If the card is removed or reset, or if switch power is interrupted during the boot software upgrade, the upgrade will not complete, the card will not operate, and the card must be returned to Cisco for repair. See the "Upgrading PXM Boot Software from Release 3.0.10 and Later" section, which appears later in this appendix.
Step 5	**switchcc**	Activate the upgraded card and place the non-upgraded card in standby mode.
Step 6	**burnboot** <*slot*> <*revision*> **dspcd** <*slot*>	Burn the boot software on the non-upgraded, standby PXM card by specifying the slot number of the standby card. See the "Upgrading PXM Boot Software from Releases Prior to 3.0.10" section, which appears later in this appendix.

Non-Graceful PXM Boot Upgrades

Non-graceful upgrades disrupt all switch traffic and are usually used in lab installations where the use of standalone cards provides no opportunity for a graceful upgrade. The quickstart procedure provides an overview and quick reference for those who have already performed ungraceful upgrades on the switch.

Note Avoid making configuration changes while upgrading PXM software. Configuration changes can be lost when the PXM is reset during the upgrade.

	Command	Purpose
Step 1	**ftp**	Copy the boot and runtime files you want to use to the switch. See the "Copying Software Files to the Switch" section later in this appendix.
Step 2	*username* *password*	Establish a CLI session with the active PXM card using the CP port on the PXM-UI-S3 or PXM-UI-S3/B back card and a user name with CISCO_GP privileges.
Step 3	**saveallcnf**	This optional step saves the current configuration to the hard disk. See the "Saving a Configuration" section in Chapter 9, "Switch Operating Procedures."
Step 4	**burnboot** <*slot*> <*revision*> **dspcd** <*slot*>	Burn the boot software on the standalone PXM card by specifying the appropriate slot number. For example: `M8850_LA.7.PXM.a > burnboot 7 4.0(0.201)` **Caution** If the card is removed or reset, or if switch power is interrupted during the boot software upgrade, the upgrade will not complete, the card will not operate, and the card must be returned to Cisco for repair. See the "Upgrading PXM Boot Software from Release 3.0.10 and Later" section, which appears later in this appendix.

Graceful PXM and Service Module Runtime Software Upgrades

When performed properly, graceful upgrades have minimal impact on connections in progress and do not interrupt any established connections.

This quickstart procedure applies to PXM1E, PXM45 and to all service module cards except the RPM family of cards. The quickstart procedure provides more detail, but the overall procedure is as follows:

1. Load the new software on the standby PXM or service module.
2. Make the standby card active.
3. Load the new software on the formerly active (now standby) card.

Note If you plan to upgrade PXM cards and service modules, upgrade the PXM cards first. Wait until the PXM cards are operating in active and standby modes with the correct software before upgrading service modules. The software version used by the PXM cards should be equal to or later than the version used on the service modules. When service module boot software is to be upgraded, it should be upgraded before upgrading the runtime software.

Caution Avoid making configuration changes while upgrading PXM software. Configuration changes can be lost when the PXM is reset during the upgrade. While graceful upgrades can be aborted with the **abortrev** command, the **abortrev** command does reset both active and standby cards, so reverting back to an earlier software release is non-graceful.

Note Cisco Systems recommends that you upgrade software on one service module at a time within a switch. Wait until each service module upgrade is complete before starting an upgrade on another service module.

To upgrade the runtime software, use the following procedure.

	Command	Purpose
Step 1	**ftp**	Copy the boot and runtime files you want to use to the switch. See the "Copying Software Files to the Switch" section, which appears later in this appendix.
Step 2		If the *Release Notes for Cisco MGX 8850 (PXM1E/PXM45), Cisco MGX 8950, and Cisco MGX 8830 Switches, Release 5.0.00* or the *Release Notes for the Cisco MGX 8880 Media Gateway, Release 5.0.00* call for a boot software upgrade, upgrade the boot software for the card you are upgrading. **Note** PXM cards should be upgraded first. For instructions on upgrading service module boot software, see the "Graceful Service Module Boot Software Upgrades" section, which appears later in this appendix.
Step 3	*username* *password*	Establish a CLI session with the active PXM45 card using a user name with SERVICE_GP privileges.
Step 4	**saveallcnf**	This optional step saves the current switch configuration to the hard disk. See the "Saving a Configuration" section in Chapter 9, "Switch Operating Procedures."
Step 5	**dspcd** **commitrev** <*slot*> <*revision*>	Verify that all previous upgrades have been committed. If a previous upgrade is not committed, commit to the new upgrade. See the "Committing to a Runtime Software Upgrade" section, which appears later in this appendix.

	Command	Purpose
Step 6	**loadrev** <*slot*> <*revision*> **dspcd**	Load the new runtime software on the standby PXM or service module.
Step 7	**runrev** <*slot*> <*revision*> **dspcd** **dspcd** <*slot*>	Switch over to the standby PXM or service module and load the new runtime software on the new standby (non-upgraded) card.
Step 8	**commitrev** <*slot*> <*revision*>	This command prevents an accidental switch back to a previous software revision if someone enters the **abortrev** command. Enter the **commitrev** command after the former active PXM45 comes up in the standby-U state. Cisco Systems recommends that you avoid configuration changes until after you have run the **commitrev** or **abortrev** commands. See the "Aborting a Runtime Software Upgrade" section and the "Committing to a Runtime Software Upgrade" section, both of which appear later in this appendix.

Non-Graceful PXM and Service Module Runtime Software Upgrades

Non-graceful upgrades disrupt switch traffic and are usually used in lab installations where the use of standalone cards provides no opportunity for a graceful upgrade. The quickstart procedure provides an overview and quick reference for those who have already performed ungraceful upgrades on the switch.

Note If you plan to upgrade PXM cards and service modules, upgrade the PXM cards first. Wait until the PXM cards are operating in active and standby modes with the correct software before upgrading service modules. The software version used by the PXM cards should be equal to or later than the version used on the service modules. When service module boot software is to be upgraded, it should be upgraded before upgrading the runtime software.

Note Avoid making configuration changes while upgrading PXM software. Configuration changes can be lost when the PXM is reset during the upgrade.

Note Cisco Systems recommends that you upgrade software on one service module at a time within a switch. Wait until each service module upgrade is complete before starting an upgrade on another service module.

	Command	Purpose
Step 1	**ftp**	Copy the boot and runtime files you want to use to the switch. See the “Copying Software Files to the Switch”section, which appears later in this appendix.
Step 2		If the *Release Notes for Cisco MGX 8850 (PXM1E/PXM45), Cisco MGX 8950, and Cisco MGX 8830 Switches, Release 5.0.00* or the *Release Notes for the Cisco MGX 8880 Media Gateway, Release 5.0.00* call for a boot software upgrade, upgrade the boot software as described in the “Graceful PXM Boot Upgrades from Release 3.0.10 and Later” section, which appears earlier in this appendix, or the “Non-Graceful Service Module Boot Software Upgrades” section, which appears later in this appendix.
Step 3	*username* *password*	Establish a CLI session with the active PXM card using a user name with SERVICE_GP privileges.
Step 4	**saveallcnf**	This optional step saves the current configuration to the hard disk. See the “Saving a Configuration” section in Chapter 9, “Switch Operating Procedures.”
Step 5	**dspcd** **commitrev** <*slot*> <*revision*>	Verify that all previous upgrades are committed. If a previous upgrade is not committed, commit to the new upgrade. See the “Committing to a Runtime Software Upgrade” section, which appears later in this appendix.
Step 6	**loadrev** <*slot*> <*revision*> **dspcd**	Define the new software version to be used.
Step 7	**runrev** <*slot*> <*revision*> **dspcd**	Reset the card and run the new software version.
Step 8	**commitrev** <*slot*> <*revision*>	This command prevents an accidental switch back to a previous software revision if someone enters the **abortrev** command. Enter the **commitrev** command after the upgraded card reaches the active state. Cisco Systems recommends that you avoid configuration changes until after you have run the **commitrev** or **abortrev** commands. See the “Aborting a Runtime Software Upgrade” section and the “Committing to a Runtime Software Upgrade” section, both of which appear later in this appendix.

Graceful Service Module Boot Software Upgrades

When performed properly, graceful upgrades have minimal impact on connections in progress and do not interrupt any established connections. This quickstart procedure applies to all service modules except the RPM family of cards and provides an overview and quick reference for those who have already performed graceful boot software upgrades on the switch.

Note If you plan to upgrade PXM cards and service modules, upgrade the PXM cards first. Wait until the PXM cards are operating in active and standby modes with the correct software before upgrading service modules. The software version used by the PXM cards should be equal to or later than the version used on the service modules.

Note Cisco Systems recommends that you upgrade software on one service module at a time within a switch. Wait until each service module upgrade is complete before starting an upgrade on another service module.

	Command	Purpose
Step 1	**ftp**	Copy the boot and runtime files you want to use to the switch. See the "Copying Software Files to the Switch" section, which appears later in this appendix.
Step 2	*username* *password*	Establish a CLI session with the *active* PXM card using a user name with SERVICE_GP privileges or higher.
Step 3	**saveallcnf**	This optional step saves the current configuration to the hard disk. See the "Saving a Configuration" section in Chapter 9, "Switch Operating Procedures."
Step 4	**burnboot** <*slot*> <*revision*> **dspcd** <*slot*>	Burn the boot software on the standby service module by specifying the slot number of the standby card. For example: `M8850_LA.7.PXM.a > burnboot 1 4.0(0.0)` **Caution** If the card is removed or reset, or if switch power is interrupted during the boot software upgrade, the upgrade will not complete, the card will not operate, and the card must be returned to Cisco for repair. See the "Upgrading Boot Software on Service Modules" section, which appears later in this appendix.
Step 5	**switchredcd** <*fromSlot*> <*toSlot*>	Activate the upgraded card and place the non-upgraded card in standby mode.
Step 6	**burnboot** <*slot*> <*revision*> **dspcd** <*slot*>	Burn the boot software on the non-upgraded, standby service module by specifying the slot number of the standby card. See the "Upgrading Boot Software on Service Modules" section, which appears later in this appendix.

Non-Graceful Service Module Boot Software Upgrades

Non-graceful upgrades disrupt all switch traffic and are usually used in lab installations where the use of standalone cards provides no opportunity for a graceful upgrade. This quickstart procedure applies to all service modules except the RPM family of cards and provides an overview and a quick reference for those who have already performed ungraceful upgrades on the switch.

Note If you plan to upgrade PXM cards and service modules, upgrade the PXM cards first. Wait until the PXM cards are operating in active and standby modes with the correct software before upgrading service modules. The software version used by the PXM cards should be equal to or later than the version used on the service modules.

Note Cisco Systems recommends that you upgrade software on one service module at a time within a switch. Wait until each service module upgrade is complete before starting an upgrade on another service module.

	Command	Purpose
Step 1	**ftp**	Copy the boot and runtime files you want to use to the switch. See the "Copying Software Files to the Switch" section, which appears later in this appendix.
Step 2	*username* *password*	Establish a CLI session with the *active* PXM card using a user name with SERVICE_GP privileges or higher.
Step 3	**saveallcnf**	This optional step saves the current configuration to the hard disk. See the "Saving a Configuration" section in Chapter 9, "Switch Operating Procedures."
Step 4	**burnboot** <*slot*> <*revision*> **dspcd** <*slot*>	Burn the boot software on the standalone service module. For example: `M8850_LA.7.PXM.a > burnboot 1 4.0(0.0)` **Caution** If the card is removed or reset, or if switch power is interrupted during the boot software upgrade, the upgrade will not complete, the card will not operate, and the card must be returned to Cisco for repair. See the "Upgrading Boot Software on Service Modules" section, which appears later in this appendix.

Graceful RPM Boot and Runtime Software Upgrades

The RPM cards support graceful boot software upgrades when 1:N redundancy is established in the switch between RPM cards. Boot software is generally upgraded less often than runtime software, so be sure to compare the recommended boot software version with the boot software running on your RPM cards before starting an upgrade. The correct boot software might already be installed.

Note In this document, the general term "RPM" refers to RPM-PR and RPM-XF cards. If a step or procedure is specific to only one of the RPM cards, it will be called out in the text.

The following quickstart procedure describes how to upgrade boot and runtime software in one operation on redundant RPM cards.

Note Redundancy must be established before you use this procedure. If redundancy has not been configured between two RPM cards, upgrade each RPM card using the procedure in the "Non-Graceful RPM Boot Software Upgrades" section later in this chapter. To add redundancy to an RPM card, see the "Establishing Redundancy Between RPM Cards" section in Chapter 6, "Preparing RPM Cards for Operation."

	Command	Purpose
Step 1	**ftp**	Copy the boot and runtime files you want to use to the switch (C:FW). See the "Copying Software Files to the Switch" section later in this appendix.
Step 2	**copy**	Optional: Copy and rename the runtime file to a generic name for easy updates. See the "Upgrading RPM Runtime Software" section later in this chapter. **Note** If you have already configured the RPM to use a generic name and you perform this step, you can skip Steps 11 through 18.
Step 3	*username* *password*	Establish a CLI session with the *active* PXM card using a user name at any access level.
Step 4	**cc** <*primarySlot*>	Select the slot in which the primary RPM card is installed.
Step 5	**enable** *password*	Enter Enable mode for the router.
Step 6	**dir x:**	Verify router access to the PXM hard disk and the boot upgrade software.
Step 7	**show flash:**	Display current contents of bootflash.
Step 8	**copy** *filename* **bootflash:** **dir bootflash:**	Copy the upgrade boot software to flash. For example: `copy x:rpm-boot-mz_002.001.060.000 bootflash:`

	Command	Purpose
Step 9	**config terminal** **boot bootldr bootflash:***filename* **^Z** **show bootvar**	Configure the BOOTLDR variable to specify the new boot software.
Step 10	**copy bootflash:***filename* **x:***filename* **del bootflash:***filename* **show flash:** **squeeze flash:**	Reorganize files in bootflash. The switch always attempts to load the first bootable file in bootflash. If the BOOTLDR variable is not set, the new boot software must be the first file listed in the **show flash:** display. Copy files you want to save to the x: directory and delete all files that appear before the new boot software. Files are marked with the **del** command and actually deleted with the **squeeze flash:** command. **Caution** Verify that at least one valid boot or runtime image will not be deleted. If all boot and runtime images are deleted from bootflash, the RPM card must be returned to the factory for repair.
Step 11	**show bootvar**	Display the current runtime software filename.
Step 12	**config terminal**	Enter the router global configuration mode.
Step 13	**no boot system**	Remove the entire boot list. To remove a single file from the boot list, include a filename. For example: `Router(config)# no boot system x:rpm-js-mz_122-4.T`
Step 14	**boot system x:***filename*	Add the new router runtime image to the boot list. For example: `Router(config)# boot system x:rpm-js-mz_122-4.T`
Step 15	`boot config e:auto_config_`*RPM-PR_*`slot#`	Configure the RPM card to store its configuration on the PXM hard disk. **Note** This step only needs to be performed once. If this command is already in the startup configuration file, you do not need to enter it again.
Step 16	**^Z**	Exit global configuration mode.
Step 17	**copy run start**	Save the new configuration. **Note** If you omit this step, the RPM card will continue to use the previous version of software.
Step 18	**show bootvar**	Verify the change in the runtime software filename.
Step 19	**switchredcd** <*primarySlot*> <*secondarySlot*>	This step makes the secondary card active and resets the primary RPM card. When the primary card resets, it loads the upgraded boot and runtime software.
Step 20	**cc** <*secondarySlot*>	Select the slot in which the secondary RPM card is installed.

	Command	Purpose
Step 21	**enable** *password* **dir x:** **show flash:** **copy** *filename* **bootflash:** **dir bootflash:** **config terminal** **boot bootldr bootflash:***filename* **^Z** **show bootvar** **copy bootflash:***filename* **x:***filename* **del bootflash:***filename* **show flash:** **squeeze flash:**	Repeat Steps 5 through 10 to move the upgraded boot software into bootflash.
Step 22	**switchredcd** <*secondarySlot*> <*primarySlot*>	This step makes the upgraded primary card active and resets the secondary RPM card. When the secondary card resets, it loads the upgraded boot software from bootflash. Both primary and secondary cards should now be using upgraded boot software. **Note** You do not need to upgrade runtime software on a secondary card. When a secondary card goes active, it loads the runtime software and configuration defined for the primary card.
Step 23	—	If there are other primary RPM cards that need upgrading, repeat the part of this procedure that upgrades the primary card, then enter the **switchredcd** command once to reload the primary card. Finally, enter the **switchredcd** command a second time to make the upgraded primary card active.

Graceful RPM Boot Software Upgrades

The RPM cards support graceful boot software upgrades when 1:N redundancy is established in the switch between RPM cards. Boot software is generally upgraded less often than runtime software, so be sure to compare the recommended boot software version with the boot software running on your RPM cards before starting an upgrade. The correct boot software might already be installed.

Note In this document, the general term "RPM" refers to RPM-PR and RPM-XF cards. If a step or procedure is specific to only one of the RPM cards, it will be called out in the text.

The following quickstart procedure describes how to upgrade redundant RPM cards.

Note Redundancy must be established before you use this procedure. If redundancy has not been configured between two RPM cards, upgrade each RPM card using the procedure in the "Non-Graceful RPM Boot Software Upgrades" section later in this chapter. To add redundancy to an RPM card, see the "Establishing Redundancy Between RPM Cards" section in Chapter 6, "Preparing RPM Cards for Operation."

	Command	Purpose
Step 1	**ftp**	Copy the boot and runtime files you want to use to the switch (C:FW). See the "Copying Software Files to the Switch" section later in this appendix.
Step 2	*username* *password*	Establish a CLI session with the *active* PXM card using a user name at any access level.
Step 3	**cc** <*primarySlot*>	Select the slot in which the primary RPM card is installed.
Step 4	**enable** *password*	Enter Enable mode for the router.
Step 5	**dir x:**	Verify router access to the PXM hard disk and the boot upgrade software.
Step 6	**show flash:**	Display current contents of bootflash.
Step 7	**copy** *filename* **bootflash:** **dir bootflash:**	Copy the upgrade boot software to flash. For example: `copy x:rpm-boot-mz_002.001.060.000 bootflash:`
Step 8	**config terminal** **boot bootldr bootflash:***filename* **^Z** **show bootvar**	Configure the BOOTLDR variable to specify the new boot software.
Step 9	**copy bootflash:***filename* **x:***filename* **del bootflash:***filename* **show flash:** **squeeze flash:**	Reorganize files in bootflash. The switch always attempts to load the first bootable file in bootflash. If the BOOTLDR variable is not set, the new boot software must be the first file listed in the **show flash:** display. Copy files you want to save to the x: directory and delete all files that appear before the new boot software. Files are marked with the **del** command and actually deleted with the **squeeze flash:** command. **Caution** Verify that at least one valid boot or runtime image will not be deleted. If all boot and runtime images are deleted from bootflash, the RPM card must be returned to the factory for repair.
Step 10	**switchredcd** <*primarySlot*> <*secondarySlot*>	This step makes the secondary card active and resets the primary RPM card. When the primary card resets, it loads the upgraded boot software from bootflash.
Step 11	**cc** <*secondarySlot*>	Select the slot in which the secondary RPM card is installed.

	Command	Purpose
Step 12	**enable** *password* **dir x:** **show flash:** **copy** *filename* **bootflash:** **dir bootflash:** **config terminal** **boot bootldr bootflash:***filename* **^Z** **show bootvar** **copy bootflash:***filename* **x:***filename* **del bootflash:***filename* **show flash:** **squeeze flash:**	Repeat Steps 4 through 9 to move the upgraded boot software into bootflash.
Step 13	**switchredcd** <*secondarySlot*> <*primarySlot*>	This step makes the upgraded primary card active and resets the secondary RPM card. When the secondary card resets, it loads the upgraded boot software from bootflash. Both primary and secondary cards should now be using upgraded boot software.
Step 14	—	If there are other primary RPM cards that need upgrading, repeat the part of this procedure that upgrades the primary card, then enter the **switchredcd** command once to reload the primary card. Finally, enter the **switchredcd** command a second time to make the upgraded primary card active.

Graceful RPM Runtime Software Upgrades

The RPM cards support graceful upgrades when 1:N redundancy is established in the switch between RPM cards.

Note In this document, the general term “RPM” refers to RPM-PR and RPM-XF cards. If a step or procedure is specific to only one of the RPM cards, it will be called out in the text.

The following quickstart procedure describes how to gracefully upgrade runtime software on redundant RPM cards.

Note Redundancy must be established before you use this procedure. If redundancy has not been configured between two RPM cards, upgrade each RPM card as described in the “Non-Graceful RPM Runtime Software Upgrades” section later in this chapter. To add redundancy to an RPM card, see the “Establishing Redundancy Between RPM Cards” section in Chapter 6, “Preparing RPM Cards for Operation.”

	Command	Purpose
Step 1	**ftp**	Copy the boot and runtime files you want to use to the switch (C:FW). See the "Copying Software Files to the Switch" section later in this appendix.
Step 2	**copy**	Optional: Copy and rename the runtime file to a generic name for easy updates. See the "Upgrading RPM Runtime Software" section later in this chapter. **Note** If you have already configured the RPM to use a generic name, you can skip to Step 12.
Step 3	*username* *password*	Establish a CLI session with the *active* PXM card using a user name at any access level.
Step 4	**cc** <*primarySlot*>	Select the slot in which the primary RPM card is installed.
Step 5	**enable** *password*	Enter Enable mode for the router.
Step 6	**show bootvar**	Display the current runtime software filename.
Step 7	**config terminal**	Enter the router global configuration mode.
Step 8	**no boot system**	Remove the entire boot list. To remove a single file from the boot list, include a filename. For example: `Router(config)# no boot system x:rpm-js-mz_122-4.T`
Step 9	**boot system x:***filename*	Add the new router runtime image to the boot list. For example: `Router(config)# boot system x:rpm-js-mz_122-4.T`
Step 10	**`boot config e:auto_config_`***RPM-PR_*`slot#`	Configure the RPM card to store its configuration on the PXM hard disk. **Note** This step only needs to be performed once. If this command is already in the startup configuration file, you do not need to enter it again.
Step 11	**^Z**	Exit global configuration mode.
Step 12	**copy run start**	Save the new configuration. **Note** If you omit this step, the RPM card will continue to use the previous version of software.
Step 13	**show bootvar**	Verify the change in the runtime software filename.
Step 14	**switchredcd** <*primarySlot*> <*secondarySlot*>	This step makes the secondary card active and resets the primary RPM card. When the primary card resets, it loads the upgraded boot software from bootflash.

	Command	Purpose
Step 15	**switchredcd** <*secondarySlot*> <*primarySlot*>	This step makes the upgraded primary card active and resets the secondary RPM-PR card. When the secondary card resets, it loads the upgraded boot software from bootflash. Both primary and secondary cards should now be using upgraded runtime software.
Step 16		If there are other primary RPM cards that need upgrading, repeat the part of this procedure that upgrades the primary card, and then enter the **switchredcd** command once to reload the primary card. Finally, enter the **switchredcd** command a second time to make the upgraded primary card active.

Non-Graceful RPM Boot Software Upgrades

Use the non-graceful upgrade procedure in this section when you need to upgrade RPM boot software and the RPM is operating in standalone mode. Non-graceful upgrades terminate all connections and disrupt service until the upgrade procedure is complete.

Note In this document, the general term "RPM" refers to RPM-PR and RPM-XF cards. If a step or procedure is specific to only one of the RPM cards, it will be called out in the text.

Note If the RPM is operating in 1:N redundancy mode with another RPM, upgrade the cards as described in the "Graceful RPM Boot Software Upgrades"section earlier in this chapter.

The following quickstart procedure provides an overview and quick reference for those who have already performed RPM upgrades on the switch. For detailed instructions, see the "Upgrade Procedures for RPM-PR and RPM-XF Cards" section which appears later in this appendix.

	Command	Purpose
Step 1	**ftp**	Copy the boot and runtime files you want to use to the switch (C:FW). See the "Copying Software Files to the Switch" section later in this appendix.
Step 2	*username* *password*	Establish a CLI session with the *active* PXM card using a user name at any access level.
Step 3	**cc** <*RPM_Slot*>	Select the slot in which the RPM card is installed.
Step 4	**enable** *password*	Enter Enable mode for the router.
Step 5	**dir x:**	Verify router access to the hard disk and the boot upgrade software.
Step 6	**show flash:**	Display current contents of bootflash.
Step 7	**copy** *filename* **bootflash:** **dir bootflash:**	Copy the upgrade boot software to flash. For example: `copy x:rpm-boot-mz_002.001.000.000 bootflash:`

	Command	Purpose
Step 8	**config terminal** **boot bootldr bootflash:***filename* **^Z** **show bootvar**	Configure the BOOTLDR variable to specify the new boot software.
Step 9	**copy bootflash:***filename* **x:***filename* **del bootflash:***filename* **show flash:** **squeeze flash:**	Reorganize files in bootflash. The switch always attempts to load the first bootable file in bootflash. If the BOOTLDR variable is not set, the new boot software must be the first file listed in the **show flash:** display. Copy files you want to save to the x: directory and delete all files that appear before the new boot software. Files are marked with the **del** command and actually deleted with the **squeeze flash:** command. **Caution** Verify that at least one valid boot or runtime image will not be deleted. If all boot and runtime images are deleted from bootflash and the card is reset, the RPM card must be returned to the factory for repair.
Step 10	**cc** <*active_PXM_slot*> **resetcd** <*RPM_Slot*>	This command sequence restarts the RPM card with the new boot image.

Non-Graceful RPM Runtime Software Upgrades

Use the non-graceful upgrade procedure in this section when you need to upgrade RPM runtime software and the RPM is operating in standalone mode. Non-graceful upgrades terminate all connections and disrupt service until the upgrade procedure is complete.

Note In this document, the general term "RPM" refers to RPM-PR and RPM-XF cards. If a step or procedure is specific to only one of the RPM cards, it will be called out in the text.

Note If the RPM is operating in 1:N redundancy mode with another RPM upgrade the cards as described in "Graceful RPM Runtime Software Upgrades," which appears earlier in this chapter.

The following quickstart procedure provides an overview and quick reference for those who have already performed RPM upgrades on the switch. For detailed instructions, see "Upgrade Procedures for RPM-PR and RPM-XF Cards," which appears later in this appendix.

	Command	Purpose
Step 1	**ftp**	Copy the boot and runtime files you want to use to the switch (C:FW). See the "Copying Software Files to the Switch" section later in this appendix.
Step 2	**copy**	Copy and rename the runtime file to a generic name for easy updates. See the "Non-Graceful RPM Runtime Software Upgrades" section later in this chapter. **Note** If you have already configured the RPM to use a generic name, you can skip to Step 12.
Step 3	*username* *password*	Establish a CLI session with the *active* PXM card using a user name at any access level.
Step 4	**cc** <*RPM_Slot*>	Select the slot in which the RPM card is installed.
Step 5	**enable** *password*	Enter Enable mode for the router.
Step 6	**show bootvar**	Display the current runtime software filename.
Step 7	**config terminal**	Enter the router global configuration mode.
Step 8	**no boot system**	Remove the entire boot list. To remove a single file from the boot list, include a filename. For example: `Router(config)# no boot system x:rpm-js-mz_122-4.T`
Step 9	**boot system x:***filename*	Add the new router runtime image to the boot list. For example: `Router(config)# boot system x:rpm-js-mz.122-4.T`
Step 10	**`boot config e:auto_config_`***RPM_slot#*	Configure the RPM card to store its configuration on the PXM hard disk. **Note** This step only needs to be performed once. If this command is already in the startup configuration file, you do not need to enter it again.
Step 11	**^Z** **copy run start**	Exit global configuration mode and save the new configuration.
Step 12	**show bootvar**	Verify the change in the runtime software filename.
Step 13	**cc** <*active_PXM_slot*> **resetcd** <*RPM_Slot*>	This command sequence selects the active PXM card and restarts the RPM card with the new runtime image.
Step 14	**dspcds** **dspcd** <*RPMR_Slot*> **cc** <*RPM_Slot*>	Verify router reboot is complete.

Quickstart Procedures for Software Downgrades

Cisco Systems, Inc. recommends that you avoid software downgrades, which replace a current software release with another that has a lower version number. However, there are some situations in which you might want to downgrade the software. For example, if you have been testing pre-release software in a lab, the software version number can be higher than a later official software release. Any time the software version number to which you are changing is lower than the current software version, the change is a downgrade, regardless of when the software versions are released.

Note For runtime software, the procedures in this section should be used only when downgrading after a complete upgrade. The **commitrev** command completes an upgrade. If an upgrade has not been completed, you can revert back to the previous software revision using the **abortrev** command as described in the "Aborting a Runtime Software Upgrade" section in this appendix.

The following sections provide quickstart procedures for the following downgrades:

- PXM and AXSM Boot Downgrades
- Non-Graceful PXM Runtime Software Downgrades
- Non-Graceful AXSM Runtime Software Downgrades

PXM and AXSM Boot Downgrades

When redundant cards are used and the downgrade software is compatible with the existing runtime software, boot software downgrades can be graceful. To perform a graceful downgrade of boot software, follow the instructions for the appropriate graceful software upgrade:

Caution Cisco Systems, Inc. does not guarantee that any software downgrade is graceful, so assume that the downgrade is non-graceful and time the downgrade accordingly. The advantage to following the graceful upgrade procedures listed above is that you might be able to delay traffic interruption until the runtime software is downgraded.

When upgrading a standalone card, the downgrade is non-graceful, and you should follow the following Graceful PXM Boot Upgrades from Release 3.0.10 and Later procedures.

Non-Graceful PXM Runtime Software Downgrades

To downgrade PXM runtime software, you must clear the entire switch configuration. All traffic is disrupted until the switch downgrade is complete and the configuration has been re-entered. The following quickstart procedure provides an overview for PXM runtime software downgrades.

Note The switch does not support a configuration restore to a downgraded software version. When you downgrade the PXM runtime software, you must re-enter the configuration.

	Command	Purpose
Step 1	*username* *password*	Establish a CLI session with the active PXM card using a user name with SERVICE_GP privileges.
Step 2	**saveallcnf** **y**	Save the current switch configuration. See the “Saving a Configuration”section in Chapter 9, “Switch Operating Procedures.” This step gives you the option to upgrade to the software version from which you are downgrading and use the former configuration.
Step 3	**ftp**	Copy the boot and runtime files you want to use to the switch. Also copy the saved configuration file from the C:CNF directory to a remote workstation so you have a backup file if something happens to the hard disk. See the “Copying Software Files to the Switch” section later in this appendix.
Step 4	**clrallcnf** **y**	Clear the current configuration. See the “Clearing a Switch Configuration” section in Chapter 9, “Switch Operating Procedures.”
Step 5	**sysVersionSet** “*version*” **reboot 2**[1]	Select the runtime firmware version the switch will use on the PXM card and restart the switch with that firmware. For example: `sysVersionSet “002.001.000.000”` Note that these commands must be entered at the PXM backup boot prompt: pxmbkup>. See the “Initializing the Switch” section in Chapter 2, “Configuring General Switch Features.”.
Step 6		Reconfigure the PXM cards as described in the “Configuration Quickstart” section in Chapter 2, “Configuring General Switch Features.”

1. Beginning with Release 4.0, you must enter **reboot 2**. For all prior releases, enter **reboot**.

Non-Graceful AXSM Runtime Software Downgrades

AXSM runtime software downgrades are always non-graceful when the PXM45 runtime software is also downgraded (because the PXM45 downgrade requires a clearing of the configuration). The quickstart procedure provides an overview of how to downgrade the AXSM software after the PXM45 runtime software has been downgraded.

	Command	Purpose
Step 1	**ftp**	Copy the boot and runtime files you want to use to the switch. See "Copying Software Files to the Switch," which appears later in this appendix.
Step 2		Refer to "Configuration Quickstart" Chapter 4, "Preparing Service Modules for Communication." The **setrev** command in the quickstart procedure clears the card configuration and assigns the downgrade software version to the card.

Browsing the File System

The PXM hard disk stores log files, configuration files, and boot and runtime software. The switch operating system supports a set of UNIX-like commands that you can use to locate log files or manage software updates. Table A-1 lists commands that you can use to browse the file system.

Note File and directory names in the switch file system are case sensitive. Also, some of the commands listed in Table A-1 are not available at all administrator access levels.

Table A-1 File System Commands at Switch Prompt

Command	Description
cd	Change directories. Access level required: ANYUSER or above.
copy	Copies a file from one location to another. Syntax: **copy** <*source file name*> <*destination file name*> Access level required: GROUP1 or above.
del	Deletes a file. Syntax: **del** <*file name*> Access level required: GROUP1 or above.
ll	List directory contents using long format, which includes the name, size, modification date, and modification time for each file. This command also displays the total disk space and free disk space. Syntax: **ll** Access level required: ANYUSER or above.
ls	List directory contents using the short format, which displays filenames, total disk space, and free disk space. Syntax: **ls** Access level required: ANYUSER or above.

Table A-1 File System Commands at Switch Prompt (continued)

Command	Description
pwd	Display the present working directory. Syntax: **pwd** Access level required: ANYUSER or above.
rename	Renames a file. Syntax: **rename** <*old file name*> <*new file name*> Access level required: GROUP1 or above.
whoami	Lists the login name for the current session. Syntax: **whoami** Access level required: ANYUSER or above.

Locating Software Updates

For information on locating software updates, see the *Release Notes for Cisco MGX 8850 (PXM1E/PXM45), Cisco MGX 8950, and Cisco MGX 8830 Switches, Release 5.0.00* and the *Release Notes for the Cisco MGX 8880 Media Gateway, Release 5.0.00*.

Copying Software Files to the Switch

This section describes how to copy software files to a Cisco MGX 8850 (PXM1E/PXM45), Cisco MGX 8830, or Cisco MGX 8950 switch. The switch cards use boot software and runtime software. Each card uses the boot software to define communications between the card components and to enable cards to start up. The runtime software defines how the card operates after startup. RPM cards function on the runtime software and use the boot software only when they cannot load the runtime software.

Note The boot and runtime software are installed on the switch at the factory. Before you copy new files to the switch, verify that you need to update them by comparing the file versions on the disk to those recommended in the *Release Notes for Cisco MGX 8850 (PXM1E/PXM45), Cisco MGX 8950, and Cisco MGX 8830 Switches, Release 5.0.00* and the *Release Notes for the Cisco MGX 8880 Media Gateway, Release 5.0.00*.

Cisco MGX switches provide a File Transfer Protocol (FTP) service to support file transfers to the switch. If you have FTP client software and network connectivity to both the switch and the server where the software files are stored, you can use FTP to transfer files directly from the server to the switch.

Note The following procedure describes how to copy files to the switch when the runtime software is up and running (showing the node name switch prompt). When the runtime software cannot load, copy the software files to the switch as described in the "Transferring Software Files to and from the Switch" section in Appendix B, "PXM Backup Boot Procedures."

Step 1 Refer to the *Release Notes for Cisco MGX 8850 (PXM1E/PXM45), Cisco MGX 8950, and Cisco MGX 8830 Switches, Release 5.0.00* or the *Release Notes for the Cisco MGX 8880 Media Gateway, Release 5.0.00* to locate a server from which you can download the files.

Step 2 Using a workstation with FTP client software, transfer PXM, service module, and RPM files from the server to the switch directory C:/FW.

Tip In the past, this guide recommended transferring RPM files to the E:RPM directory. You can still do this and reference the E:RPM directory by entering e: while in RPM enable mode. However, storing boot and runtime software in the E:RPM directory significantly increases the size of configuration files created with the **saveallcnf** command. E:RPM is still used to store configuration files that should be backed up.

The procedure you use for transferring the files depends on the FTP client software you are using. When initiating the FTP connection, remember the following:

- Select the switch by entering its IP address.
- When prompted for a username and password, enter the username and password you use when managing the switch.
- When configuring file transfer options, select binary mode for the file transfer.

Step 3 To verify that the new files have been transferred to the switch, log into the switch and display the contents of the C:/FW directory.

Step 4 Using a workstation with FTP client software, transfer SCT files from the server to the switch directory C:/SCT/TEMP.

Step 5 To verify that the new SCT files have been transferred to the switch, log into the switch and display the contents of the C:/SCT/TEMP directory.

For more information on browsing the switch file system, see the "Browsing the File System" section earlier in this appendix.

Upgrade Procedures for PXM Cards and Service Modules

The following sections describe procedures that support upgrades to PXM cards and to all service modules except the RPM family of cards. For complete upgrade procedures, see the "Quickstart Procedures for Software Upgrades" section, which appears earlier in this appendix. The procedures in this section detail some of the tasks listed in the quickstart procedures.

Upgrading PXM Boot Software from Releases Prior to 3.0.10

This section describes how to upgrade the PXM boot software on a single PXM card running a release prior to Release 3.0.10. If you are performing a graceful upgrade, use the quickstart procedure described in "Graceful PXM Boot Upgrades from Releases Prior to Release 3.0.10," which appears earlier in this appendix. The following procedure provides detailed information on the upgrade task within the quickstart procedure.

Step 1 If you have not done so already, establish a CLI session with the PXM card using the CP port on the PXM-UI-S3 or PXM-UI-S3/B back card and a user name with CISCO_GP privileges.

Step 2 If you have not done so already, change to PXM Backup Boot mode as described in the "Changing to PXM Backup Boot Mode" section in Appendix B, "PXM Backup Boot Procedures."

Step 3 To burn the boot software on the PXM, enter the **sysFlashBootBurn** command as follows:

```
pxm45bkup> sysFlashBootBurn "path/filename"
```

Caution If the card is removed or reset, or if switch power is interrupted during the boot software upgrade, the upgrade will not complete, the card will not operate, and the card must be returned to Cisco for repair.

Replace *filename* with the complete path to the boot file on the PXM45 hard drive. For example:

```
pxm45bkup> sysFlashBootBurn "C:FW/pxm45_004.000.000.201_bt.fw"
```

Step 4 When the switch prompts you to confirm this action, type **y** and press **Return**.

When the boot code burning process is complete, the switch displays a message similar to the following example:

```
Flash download completed ...
value = 0 = 0x0
```

Step 5 When the boot code has been burned, reset the card with the **reboot** command. For example:

```
pxm45bkup> reboot 2
```

Note Beginning with Release 4.0, you must enter **reboot 2**. For all prior releases, enter **reboot**.

Be patient and wait for the Login prompt to appear.

Step 6 When the Login prompt appears, log in to the switch as you do at the beginning of a CLI session. The switch prompt should appear.

Step 7 To confirm that the PXM card is now using the correct boot code, enter the **dspcd** command.

The Boot FW Rev row in the display should show the new revision as shown in the following example:

```
8850_NY.7.PXM.a > dspcd
8850_NY                      System Rev: 02.01   Mar. 04, 2001 22:47:23 PST
MGX8850                                          Node Alarm: NONE
Slot Number    7    Redundant Slot:  8

                    Front Card          Upper Card          Lower Card
                    ----------          ----------          ----------

Inserted Card:      PXM45               UI Stratum3         PXM HardDiskDrive
Reserved Card:      PXM45               UI Stratum3         PXM HardDiskDrive
State:              Active              Active              Active
Serial Number:      SBK050302AF         SBK045203PJ         SBK044602HJ
Prim SW Rev:        3.0(0.0)            ---                 ---
Sec SW Rev:         3.0(0.0)           ---                 ---
Cur SW Rev:         3.0(0.0)           ---                 ---
Boot FW Rev:        4.0(0.0)              ---                 ---
800-level Rev:      A0                  A0                  A0
800-level Part#:    800-06147-08        800-05787-02        800-05052-04
CLEI Code:          BAA670YCAA          BA7IBCLAAA          BA7IADNAAA
Reset Reason:       On Power up
Card Alarm:         NONE
Failed Reason:      None
Miscellaneous Information:

Type <CR> to continue, Q<CR> to stop:
```

After you confirm the upgrade to the PXM card, the boot software upgrade for that card is complete.

Upgrading PXM Boot Software from Release 3.0.10 and Later

The upgrade procedure for the boot software on a single PXM card is the same for graceful and non-graceful upgrades. The difference between the graceful and non-graceful upgrades is the sequence of commands before and after the upgrade on a single card. For information on the proper sequence, see the “Graceful PXM Boot Upgrades from Release 3.0.10 and Later” section earlier in this appendix.

Note For PXM cards, this procedure applies only if you are upgrading from Release 3.0.10 or later. If you are upgrading from a release prior to Release 3.0.10, you need to follow the procedure in the “Upgrading PXM Boot Software from Releases Prior to 3.0.10” section earlier in this appendix.

To upgrade the boot software, use the following procedure.

Step 1 Copy the new boot software files for the PXM card to the switch as described in the “Copying Software Files to the Switch” section, which appears earlier in this appendix.

Step 2 Establish a CLI session with the switch using a user name with SERVICE_GP privileges or higher.

Step 3 To burn the new PXM boot code, enter the **burnboot** command as follows:

```
pop20one.7.PXM.a > burnboot <slot> <revision>
```

Caution If the card is removed or reset, or if switch power is interrupted during the boot software upgrade, the upgrade will not complete, the card will not operate, and the card must be returned to Cisco for repair.

Replace <*slot*> with the slot number of a standalone PXM card, or a PXM card operating in standby mode. Replace <*revision*> with the software revision number to which you are upgrading. For example:

```
pop20one.7.PXM.a > burnboot 8 3.0(0.0)
```

Step 4 When prompted to confirm the upgrade, type **y** and press **Return**.

After you confirm the upgrade, the new boot code is burned into the PXM and the card is reset. Be patient, the card reset takes some time. You can enter the **dspcds** command to display the status of the PXM card. At first, the status may show that the card slot is empty or the card is rebooting. Reenter the command periodically to see the current status of the card. When the card status returns to active or standby, you are ready to continue.

Step 5 To confirm that the PXM card is now using the correct boot code, enter the **dspcd** <*slot*> command. The Boot FW Rev row in the display should show the new revision as shown in the following example:

```
M8950_SF.7.PXM.a > dspcd 7
M8950_SF                         System Rev: 02.01   Feb. 04, 2004 19:25:26 GMT
MGX8950 (JBP-2)                                      Node Alarm: CRITICAL
Slot Number    7    Redundant Slot:  8

                    Front Card          Upper Card          Lower Card
                    ----------          ----------          ----------

Inserted Card:      PXM45B              UI Stratum3         PXM HardDiskDrive
Reserved Card:      PXM45               UI Stratum3         PXM HardDiskDrive
State:              Active              Active              Active
Serial Number:      SAG053558VP         SBK0449017Q         SBK042700M6
Prim SW Rev:        3.0(0.0)            ---                 ---
Sec SW Rev:         3.0(0.0)            ---                 ---
Cur SW Rev:         3.0(0.0)            ---                 ---
Boot FW Rev:        3.0(0.0)            ---                 ---
800-level Rev:      A0                  A0                  A0
800-level Part#:    800-09266-04        800-05787-02        800-05052-04
CLEI Code:          BAA53MZCAB          BA7IBCLAAA          BA7IADNAAA
Reset Reason:       On Reset From Shell
Card Alarm:         NONE
Failed Reason:      None
Miscellaneous Information:

Type <CR> to continue, Q<CR> to stop:
```

After you confirm the upgrade to the PXM card, the boot software upgrade for that card is complete.

Upgrading Boot Software on Service Modules

The upgrade procedure for the boot software on a single service module is the same for graceful and non-graceful upgrades. The difference between the graceful and non-graceful upgrades is the sequence of commands before and after the upgrade on a single card. For information on the proper sequence for graceful upgrades, see the "Graceful Service Module Boot Software Upgrades" section earlier in this appendix.

To upgrade service module boot software, use the following procedure.

Step 1 Copy the new boot software files for the service module to the switch as described in the "Copying Software Files to the Switch" section, which appears earlier in this appendix.

Step 2 Establish a CLI session with the switch using a user name with SERVICE_GP privileges or higher.

Step 3 To burn the new service module boot code, enter the **burnboot** command as follows:

```
pop20one.7.PXM.a > burnboot <slot> <revision>
```

Caution If the card is removed or reset, or if switch power is interrupted during the boot software upgrade, the upgrade will not complete, the card will not operate, and the card must be returned to Cisco for repair.

Replace <*slot*> with the slot number of a standalone service module or service module operating in standby mode. Replace <*revision*> with the software revision number to which you are upgrading. For example:

```
pop20one.7.PXM.a > burnboot 1 3.0(0.0)
```

Step 4 When prompted to confirm the upgrade, type **y** and press **Return**.

After you confirm the upgrade, the new boot code is burned into the service module and the card is reset. Be patient, the card reset takes some time. You can enter the **dspcds** command to display the status of the card. At first, the status may show that the card slot is empty or the card is rebooting. Reenter the command periodically to see the current status of the card. When the card status returns to active or standby, you are ready to continue.

Step 5 To confirm that the service module is now using the correct boot code, enter the **dspcd** <*slot*> command. The Boot FW Rev row in the display should show the new revision as shown in the following example:

```
8850_NY.7.PXM.a > dspcd 1
8850_NY                          System Rev: 02.01   Mar. 04, 2001 22:58:22 PST
MGX8850                                              Node Alarm: NONE
Slot Number:   1    Redundant Slot: NONE

                    Front Card          Upper Card          Lower Card
                    ----------          ----------          ----------

Inserted Card:      AXSM_4OC12          SMFIR_2_OC12        SMFIR_2_OC12
Reserved Card:      AXSM_4OC12          SMFIR_2_OC12        UnReserved
State:              Active              Active              Active
Serial Number:      SAK0344001V         SBK0406002K         SAK032800Q6
Prim SW Rev:        3.0(0.0)              ---                 ---
Sec SW Rev:         3.0(0.0)              ---                 ---
Cur SW Rev:         3.0(0.0)              ---                 ---
Boot FW Rev:        3.0(0.0)              ---                 ---
800-level Rev:
800-level Part#:    800-05774-05        800-05383-01        800-05383-01
CLEI Code:          1234567890          BAI9ADTAAA          0
Reset Reason:       On Power up
Card Alarm:         NONE
Failed Reason:      None
Miscellaneous Information:
```

After you confirm the upgrade to the service module, the boot software upgrade for that card is complete.

Loading the Runtime Upgrade Software

This section describes how to load the runtime upgrade software in preparation for running it. Production switches should have redundant cards installed, so that upgrades can occur without interrupting traffic. For graceful upgrades, the upgrade software is loaded on the standby card first, and then the control is switched to upgraded card so that the other card can be upgraded. The best way to assess the upgrade status of a card is to enter the **dspcd** <*slot*> command. For example:

```
8850_NY.7.PXM.a > dspcd
8850_NY                    System Rev: 02.01   Mar. 04, 2001 22:47:23 PST
MGX8850                                        Node Alarm: NONE
Slot Number    7    Redundant Slot:  8

                    Front Card          Upper Card          Lower Card
                    ----------          ----------          ----------

Inserted Card:      PXM1E               UI Stratum3         PXM HardDiskDrive
Reserved Card:      PXM1E               UI Stratum3         PXM HardDiskDrive
State:              Active              Active              Active
Serial Number:      SBK050302AF         SBK045203PJ         SBK044602HJ
Prim SW Rev:        4.0(0.0)             ---                 ---
Sec SW Rev:         4.0(0.0)             ---                 ---
Cur SW Rev:         4.0(0.0)             ---                 ---
Boot FW Rev:        4.0(0.0)              ---                 ---
800-level Rev:      A0                  A0                  A0
800-level Part#:    800-06147-08        800-05787-02        800-05052-04
CLEI Code:          BAA670YCAA          BA7IBCLAAA          BA7IADNAAA
Reset Reason:       On Power up
Card Alarm:         NONE
Failed Reason:      None
Miscellaneous Information:

Type <CR> to continue, Q<CR> to stop:
```

The primary (Prim SW Rev), secondary (Sec SW Rev), and current (Cur SW Rev) software revision labels indicate the status of an upgrade. In this example, these numbers match because the runtime software upgrade has not started. (Note that the boot software has been upgraded as indicated by the Boot FW Rev label.)

The primary software revision indicates which revision a card will run if it becomes active, and the secondary revision indicates an alternate revision that the card will use if the **abortrev** command is entered. (For more information on aborting an upgrade, see the "Aborting a Runtime Software Upgrade" section later in this appendix.) The current software revision represents the software the active card is using.

The normal sequence of commands for a runtime software upgrade is **loadrev**, **runrev**, and **commitrev**. Table A-2 shows how the software revision levels change during a graceful runtime software upgrade.

Table A-2 Software Versions Reported During Graceful Upgrades

Upgrade Status		**Before Upgrade**		**After loadrev**		**After runrev**		**After commitrev**	
	MGX 8850, MGX 8880, MGX 8950	**Slot 7**	**Slot 8**	**Slot 7**	**Slot 8**	**Slot 7**	**Slot 8**	**Slot 7**	**Slot 8**
Slot Number	**MGX 8830**	**Slot 1**	**Slot 2**	**Slot 1**	**Slot2**	**Slot 1**	**Slot 2**	**Slot 1**	**Slot 2**
Slot State		**Active**	**Standby**	**Active**	**Standby**	**Standby**	**Active**	**Active**	**Standby**
Primary software version		3.0(0)	3.0(0)	3.0(0)	3.0(0)	4.0(0.0)	4.0(0.0)	4.0(0.0)	4.0(0.0)
Secondary software version		3.0(0.0)	3.0(0.0)	4.0(0.0)	4.0(0.0)	3.0(0.0)	3.0(0.0)	4.0(0.0)	4.0(0.0)
Current software version		3.0(0.0)	3.0(0.0)	3.0(0.0)	4.0(0.0)	4.0(0.0)	4.0(0.0)	4.0(0.0)	4.0(0.0)

For non-graceful upgrades, the load process defines the software version to which the switch is about to be upgraded. Table A-3 shows how the revision levels change during a non-graceful upgrade.

Table A-3 Software Versions Reported During Non-Graceful Upgrades

Software Revision	**Before Upgrade**	**After loadrev**	**After runrev**	**After commitrev**
Primary	3.0(0.0)	3.0(0.0)	4.0(0.0)	4.0(0.0)
Secondary	3.0(0.0)	4.0(0.0)	3.0(0.0)	4.0(0.0)
Current	3.0(0.0)	3.0(0.0)	4.0(0.0)	4.0(0.0)

If you are performing a graceful upgrade, use the quickstart procedure described in the "Graceful PXM and Service Module Runtime Software Upgrades" section earlier in this appendix. The following procedure provides detailed information on the load task within the quickstart procedure.

Step 1 To load the upgrade runtime software version on a PXM card or service module, enter the following command:

```
mgx8850a.7.PXM.a > loadrev <slot> <revision>
```

Replace <*slot*> with the card slot number for the card to be upgraded, and replace <*revision*> with the software version number for the update. For graceful upgrades, you can specify either the active or the standby card. The switch software will automatically load the upgrade software on the standby card when it is installed. The following example shows how to enter this command:

```
mgx8850a.7.PXM.a > loadrev 7 4.0(0.0)
```

After you enter the loadrev command, the standby card comes up in the standby-U state.

You can find the software version number in the *Release Notes for Cisco MGX 8850 (PXM1E/PXM45), Cisco MGX 8950, and Cisco MGX 8830 Switches, Release 5.0.00* or the *Release Notes for the Cisco MGX 8880 Media Gateway, Release 5.0.00*. You can also determine the version number from the runtime software filename as described in the "*Determining the Software Version Number from Filenames*" section in Chapter 9, "Switch Operating Procedures."

Step 2 When prompted to confirm the command, type **y** and press **Return** to continue.

Step 3 To verify that the load command was processed correctly, enter the **dspcd** <*slot*> command and check the status of the software revision levels. You can also view the revision levels with the **dsprevs** command.

Note In a standalone configuration, the switch does not start the upgraded software until the **runrev** command is entered. In a redundant configuration, the switch starts the upgraded software on the standby card. The standby card does not become active until the **runrev** command is entered.

Starting the Upgrade Software

After you load the runtime upgrade software for a PXM or service module, enter the **runrev** command to start using the software. The version levels for graceful and non-graceful upgrades change as shown earlier in Table A-2 and Table A-3. The following procedure describes how to start the upgrade software.

Step 1 To start using the new runtime software version on a PXM card or service module card, enter the following command:

```
mgx8850a.7.PXM.a > runrev <slot> <revision>
```

Replace <*slot*> with the card slot number, and replace <*revision*> with the software version number specified with the **loadrev** command. For graceful upgrades, you can specify either the active or the standby card. The switch software will automatically run the upgrade software on the standby card when it is installed. The following example shows how to enter this command:

```
mgx8850a.7.PXM.a > runrev 7 4.0(0.0)
```

The active card is reset, and the former standby card comes up in the active-U state.

Step 2 When prompted to confirm the command, type **y** and press **Return** to continue.

Step 3 To verify that the load command was processed correctly, enter the **dspcd** <*slot*> command and check the status of the software revision levels. You can also view the revision levels with the **dsprevs** command.

Step 4 When the former active card comes up in the standby-U state, enter the **commitrev** command to commit to that software version. This step is optional.

After the **runrev** command is entered, the switch starts running the new software revision. The secondary software revision shows that a previous revision is still available. Whenever the secondary software revision is different from the primary and current software revisions, you can revert back to the secondary software revision as described in the "Aborting a Runtime Software Upgrade" section later in this appendix.

Aborting a Runtime Software Upgrade

After upgrading PXM or service module runtime software, you can revert to the previously used version of software as long as you have not used the **commitrev** command to finalize the upgrade. The **commitrev** command is described in the next section.

Keep the following in mind when you use the **abortrev** command to abort the new runtime software during an upgrade:

- If you enter the **abortrev** command on a redundant card set after the **loadrev** command was entered, and while the cards are in the Loadrev Done-U state, only the standby card will be reset.
- If you enter the **abortrev** command on a redundant card set after you entered the **runrev** command, while the cards are in the Runrev Done-U state, both the active and standby cards will be reset.
- If you enter the **abortrev** command on a single card, after you entered the **loadrev** command and the card is in the Loadrev Done-U state, the card will not be reset.
- If you enter the **abortrev** command on a single card, after you entered the **runrev** command and the card is in the Runrev Done-U state, will be reset.

To display the current state of the card, enter the **dsprevs -sl** command. The card state appears under the *Rev Chg Status* column. In the following example, the PXM cards in slot 7 and 8 are in the Loadrev Done-U state.

```
Unknown.7.PXM.a > dsprevs -sl
Unknown                          System Rev: 03.00   Feb. 06, 2003 21:22:58 GMT
MGX8850                                              Node Alarm: MAJOR
Phy. Log. Cur Sw           Prim Sw          Sec Sw           Rev Chg
Slot Slot Revision         Revision         Revision         Status
---- ---- --------         --------         --------         -------

01   01   ---              ---              ---              ---
02   02   ---              ---              ---              ---
03   03   ---              ---              ---              ---
04   04   ---              ---              ---              ---
05   05   ---              ---              ---              ---
06   06   ---              ---              ---              ---
07   07   3.0(20.62)A      3.0(20.62)A      3.0(20.62)A      Loadrev Done-U
08   07   ---              3.0(20.62)A      3.0(20.62)A      Loadrev Done-U
09   09   ---              ---              ---              ---
10   10   ---              ---              ---              ---
11   11   ---              ---              ---              ---
12   12   ---              ---              ---              ---
13   13   ---              ---              ---              ---
14   14   ---              ---              ---              ---
15   15   ---              ---              ---              ---
16   15   ---              ---              ---              ---

    Type <CR> to continue, Q<CR> to stop:
```

Caution Reverting to the previously used version of runtime software resets both PXM cards and terminates all calls in progress.

To revert to the previously used runtime software version, use the following procedure.

Step 1 Establish a configuration session using a user name with SERVICE_GP privileges or higher.

Step 2 To display the software revisions known to the switch, enter the **dspcd** <*slot*> command. (You can also view the revision levels with the **dsprevs** command.)

Replace *slot* with the slot number of the active card. To complete the next step, you need to know the secondary software revision shown in the display.

Note If the primary and secondary software revisions are the same, there is no other revision level to revert back to.

Step 3 To abort use of the primary software revision and revert back to the secondary software revision, enter the following command:

```
mgx8850a.7.PXM.a > abortrev <slot> <revision>
```

Replace <*slot*> with the card slot number for the active card, and replace <*revision*> with the software version number for the secondary software revision.

Step 4 To verify that the standby card is running the previously used software version, enter the **dspcd** <*slot*> command to view the software version in use. You can also view the revision levels with the **dsprevs** command.

Committing to a Runtime Software Upgrade

Committing to an upgrade does the following:

- Disables use of the **abortrev** command to revert back to the previously used version of software
- Enables upgrading of the current version of software

Once you are sure that an upgrade is stable, you can use the **commitrev** command commit to that software version. Committing to the current software version prevents other administrators from inadvertently reverting to the previous version. You must also commit to the current software version before you can upgrade to another software version.

To commit to the currently running runtime software version, use the following procedure.

Step 1 Establish a configuration session using a user name with SERVICE_GP privileges or higher.

Step 2 Determine if there is an unfinished upgrade by doing the following:

a. If necessary, use the **cc** command to select the active PXM card.

b. Enter the **dspcd** <*slot*> command.

c. Check the **dspcd** command report to see if the same software revision is listed for the Primary Software Revision (Prim SW Rev), Secondary Software Revision (Sec SW Rev), and Current Software Revision (Curr SW Rev).

If all version numbers are identical, the runtime software can be upgraded. There is no need to commit to the current software revision.

Step 3 To commit to the software version, enter the following command:

```
mgx8850a.7.PXM.a > commitrev <slot> <revision>
```

Replace <*slot*> with the card slot number for the active card, and replace <*revision*> with the software version number for the currently used software version. To display the software version number, use the **dspcd** <*slot*> command to view the software version in use. You can also view the revision levels with the **dsprevs** command.

Note Cisco Systems recommends that you avoid configuration changes until after you have run the **commitrev** or **abortrev** commands.

Upgrade Procedures for RPM-PR and RPM-XF Cards

The following sections describe how to upgrade boot and runtime software on RPM-PR and RPM-XF cards.

Note In this document, the general term "RPM" refers to RPM-PR and RPM-XF cards. If a step or procedure is specific to only one of the RPM cards, it will be called out in the text.

Upgrading RPM Boot Software

At the factory, a boot file is installed in the bootflash on the RPM card and is used to boot the card. The runtime software is updated more frequently than the boot software. However, the boot software is updated occasionally. When you are updating runtime software, check the release notes that accompany the runtime software to see if a boot software upgrade is required.

The boot software is stored in bootflash memory on the RPM card. To manage the software in bootflash, you access it as if it were a hard disk. For example, in copy and delete file commands, files are identified as bootflash:*filename* (which is similar to x:*filename*).

The following example shows a directory of bootflash contents:

```
Router(boot)#show flash:
-#- ED --type-- --crc--- -seek-- nlen -length- -----date/time------ name
1   .D config   D4F7352A   40330   18      686 Jan 30 2001 18:18:41 auto_config_slot09
2   .D config   CBF007C1   40660    9      688 Feb 22 2001 15:33:11 slot9.cnf
3   .. image    F596869A  2973E8   27  2452744 Feb 28 2001 03:16:05
rpm-boot-mz_002.001.000.000
```

Note Although you can display directory contents with the **dir bootflash:** command, the **show flash:** command provides more detail. Although bootflash and flash are separate entities on other Cisco Routers, both terms refer to the same entity on the RPM.

In the example above, the numbers in the left column indicate the order in which the RPM will try to load software. The second column shows that the first two files are marked for deletion (D). The last column lists the names of the files stored in bootflash.

When managing the bootflash, consider the following facts:

- If the BOOTLDR variable is set and the RPM card is reset, the RPM card attempts to load the boot software specified.
- If the BOOTLDR variable is *not* set and the RPM card is reset, the RPM card tries to load the first bootable image in bootflash. The first bootable image is the image that appears first in the **show flash:** command display, and this is usually the oldest file in bootflash. Therefore, if you do not use the BOOTLDR variable, the bootflash contents must be reorganized each time you upgrade boot software.
- The RPM card will not attempt to boot from automatic configuration files, which are named using the format *auto_config_slotnn*, where nn represents a slot in which an RPM card is installed.
- If the image that RPM tries to load does not load, you can reset the RPM from the active PXM card using the **resetcd** <*slot*> command.
- Files are not removed from bootflash until the **squeeze flash:** command is entered. If you delete a file and do not enter **squeeze flash:**, the RPM card will still attempt to boot from the first image it finds, whether it is marked for deletion or not.

Caution If all bootable images are deleted from bootflash, the card must be returned to the factory to be reprogrammed.

If you do need to upgrade the boot software, you can copy the new boot file to the PXM disk, and then copy it to the bootflash. The following procedure describes how to upgrade the boot software.

Step 1 Copy the new boot software file for the RPM card to the switch (C:FW) as described in the "Copying Software Files to the Switch" section earlier in this appendix.

Tip In the past, this guide recommended transferring files to the E:RPM directory. You can still do this and reference the E:RPM directory by entering e: while in enable mode. However, storing boot and runtime software in the E:RPM directory significantly increases the size of configuration files created with the **saveallcnf** command. E:RPM is still used to store configuration files that should be backed up.

Step 2 Establish a configuration session using any valid user name.

Step 3 Enter the **cc** command to select the RPM card to update.

```
pop20two.7.PXM.a > cc 9

(session redirected)

Router>
```

The switch displays the Cisco IOS prompt for the router on the RPM card. From this point on, all commands are Cisco IOS commands.

Note This procedure assumes that you are familiar with Cisco IOS commands (which is a topic that is beyond the scope of this book). This procedure details only those commands that are unique to setting up RPM on the switch. For general Cisco IOS commands, examples are given to show how to complete the task.

Step 4 Enter Enable mode for the router.

```
Router>enable
Password:
Router#
```

Step 5 To verify router access to the PXM hard disk and display the boot file name, enter **dir x:** command.

```
Router#dir x:
Directory of x:/

    0  -rw-     2253552  May 11 2004 15:47:06 +00:00  mpsm_t1e1_030.000.004.016-P2.fw
    0  -rw-    10655280   Apr 2 2004 08:46:30 +00:00  rpm-js-mz.123-2.T5
    0  -rw-     3350304   Apr 2 2004 08:46:12 +00:00  rpm-boot-mz.123-2.T5
    0  -rw-     1431512  May 11 2004 15:47:00 +00:00  mpsm_t1e1_030.000.004.016-P1_bt.fw
    0  -rw-     1030532  May 11 2004 15:46:42 +00:00  frsm_vhs_022.000.005.019-A.fw
    0  -rw-      891552  May 11 2004 15:46:38 +00:00  frsm_8t1e1_022.000.005.019-A.fw
    0  -rw-      303936  May 11 2004 15:46:30 +00:00  cesm_t3e3_CE8_BT_1.0.02.fw
    0  -rw-      641312  May 11 2004 15:46:28 +00:00  cesm_t3e3_022.000.005.019-A.fw
    0  -rw-      743136  May 11 2004 15:46:24 +00:00  cesm_8t1e1_022.000.005.019-A.fw
    0  -rw-      826392  May 11 2004 15:38:56 +00:00  vxsm_005.000.004.034-A_bt.fw
    0  -rw-    10528336  May 11 2004 15:38:44 +00:00  vxsm_005.000.004.034-A.fw
    0  -rw-     7939476  May 11 2004 15:38:06 +00:00  pxm45_005.000.004.034-A_mgx.fw
    0  -rw-     1160328  May 11 2004 15:37:54 +00:00  pxm45_005.000.004.034-A_bt.fw
    0  -rw-      468388  May 11 2004 15:46:46 +00:00  frsm_vhs_VHS_BT_1.0.06.fw
    0  -rw-     1245112  May 11 2004 15:37:42 +00:00  mpsm155_005.000.004.034-P1_bt.fw
    0  -rw-     4069552  May 11 2004 15:37:36 +00:00  mpsm155_005.000.004.034-P1.fw
    0  -rw-      737896  May 11 2004 15:37:20 +00:00  frsm12_005.000.004.034-A_bt.fw
    0  -rw-     2490064  May 11 2004 15:37:14 +00:00  frsm12_005.000.004.034-A.fw
    0  -rw-     3674368  May 11 2004 15:36:54 +00:00  axsmxg_005.000.004.034-P1.fw
    0  -rw-      838840  May 11 2004 15:36:46 +00:00  axsmxg_005.000.004.034-A_bt.fw
    0  -rw-      742168  May 11 2004 15:36:44 +00:00  axsme_005.000.004.034-A_bt.fw
    0  -rw-      297988  May 11 2004 15:46:40 +00:00  frsm_8t1e1_FR8_BT_1.0.02.fw
    0  -rw-      264592  May 11 2004 15:46:26 +00:00  cesm_8t1e1_CE8_BT_1.0.02.fw
    0  -rw-     3111904  May 11 2004 15:36:38 +00:00  axsme_005.000.004.034-A.fw
    0  -rw-      744600  May 11 2004 15:36:32 +00:00  axsm_005.000.004.034-A_bt.fw
    0  -rw-     3267520  May 11 2004 15:36:22 +00:00  axsm_005.000.004.034-A.fw
    0  -rw-      248686  May 11 2004 15:32:56 +00:00  vism_8t1e1_VI8_BT_3.2.00.fw
    0  -rw-     4135448  May 11 2004 15:32:52 +00:00  vism_8t1e1_003.053.103.007-I.fw
    0  -rw-     4135000  May 11 2004 15:32:42 +00:00  vism_8t1e1_003.003.103.007-I.fw

838616064 bytes total (721004544 bytes free)
```

Step 6 To display the files in the bootflash, enter the **show flash:** command.

```
Router#show flash:
-#- ED --type-- --crc--- -seek-- nlen -length- -----date/time------ name
1   .. image    F596869A  296D88   27  2452744 Feb 28 2001 03:16:05 rpm-boot-mz_122-4.T

30315128 bytes available (2452872 bytes used)
```

Step 7 To copy new boot software to the bootflash, enter the **copy** command.

```
Router#copy x:rpm-boot-mz_002.001.000.000 bootflash:
Destination filename [rpm-boot-mz_002.001.000.000]?
CCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCC
CCCCCCCCCCCCCCCCCCCCC
2334044 bytes copied in 35.768 secs (66686 bytes/sec)
```

Tip When prompted for the destination filename, press **enter** to use the source filename shown in the prompt. To change the destination filename, type a new filename after the prompt.

Step 8 To verify that the file was copied, enter the **show flash:** command.

Step 9 To set the BOOTLDR variable to specify the new boot software, complete the following steps:

a. Enter the router global configuration mode

```
Router#config terminal
Enter configuration commands, one per line.  End with CNTL/Z.
```

b. Set the BOOTLDR variable to the new boot image to be loaded

```
Router(config)#boot bootldr bootflash:rpm-boot-mz_002.001.000.000
```

c. Exit global configuration mode and save the new configuration.

```
Router(config)#^Z
Router#copy run start
Destination filename [startup-config]?
Building configuration...
[OK]
```

d. Verify that the BOOTLDR variable is set

```
RPM-XF#show bootvar
BOOT variable = bootflash:rpmxf-......
CONFIG_FILE variable =
BOOTLDR variable = bootflash:rpm-boot-mz_002.001.000.000
Configuration register is 0x2
```

Step 10 To reorganize the bootflash so that the new boot software is loaded first when the BOOTLDR variable is not set, complete the following steps:

a. Because all files that precede the new boot image in bootflash have to be deleted, copy bootflash files you want to save to the PXM hard disk using the following command.

```
Router#copy  bootflash:filename x:filename
```

b. Mark all the files that precede the new boot image in bootflash using the **del bootflash:** command as shown in the following example:

```
Router#del bootflash:
Delete filename []? rpm-js-mz
Delete bootflash:rpm-js-mz? [confirm]
Router#
```

Tip To unmark a bootflash file so that it won't be deleted when the **squeeze flash:** command is run, enter the **undelete** <*number*> command, where *number* is the file number displayed in the left-most column of the **show flash:** command display.

c. To delete all files that are marked for deletion from bootflash, enter the **squeeze flash:** command as shown in the following example:

```
Router(boot)#squeeze flash:
All deleted files will be removed. Continue? [confirm]y
Squeeze operation may take a while. Continue? [confirm]

Squeeze of bootflash complete
```

d. Copy any previously saved bootflash files you want to use from the PXM hard disk using the following command.

```
Router#copy x:filename bootflash:filename
```

You might want to copy previously saved configuration files back to bootflash, or you might want to copy an older boot image to be used if the newer version becomes corrupt.

e. Enter the **show flash:** command to verify that the bootflash files are as you want them. The preferred boot software should appear first in the list.

Caution If all bootable images are deleted from bootflash and the RPM card is restarted, the card must be returned to the factory to be reprogrammed. When you are done managing the bootflash, the **show flash:** command should display at least one bootable image, and the image you want the card to boot from should be the first bootable image in the list.

Tip If the **show flash:** command does not display a bootable image, copy a bootable image to bootflash as described earlier in this procedure. You can continue to manage the bootflash, even when there are no files in bootflash, until the router is restarted.

Step 11 When you are sure the bootflash is ready for use, you can enter the **reload** command to restart the RPM card, or you can upgrade the runtime software as described in the next section.

Tip If the bootflash contains bootable images and the sequence is such that the card will not start, you can enter rommon mode and load the bootable image. To get into rommon mode, establish a console connection to the RPM card, reset the RPM card using the **resetcd** <*slot*> command from the active PXM card, then quickly enter the **CTRL-[**, **Break** sequence at the RPM console. The command to send a **Break** depends on the computer platform and software you are using. It may take a couple of attempts to successfully get into rommon mode. When you are in rommon mode, the RPM card displays the *rommon 1 >* prompt.

Once in rommon mode, you can enter the **dir bootflash:** command to display the images in bootflash. To boot one of the images, enter a **boot** command using the following format: **boot bootflash:***filename*.

Upgrading RPM Runtime Software

The runtime software on the RPM-PR and RPM-XF cards can be loaded from the following sources:

- The C:FW directory on the PXM hard disk
- Bootflash
- A TFTP server on a LAN to which an RPM back card is connected.

Note In this document, the general term “RPM” refers for both the RPM-PR and RPM-XF cards. If a step or procedure is specific to only one of the RPM cards, it will be called out in the text.

Cisco Systems recommends that you configure the RPM card to load from the C:FW directory on the PXM hard disk. Images will load much faster from bootflash, but if you are using multiple RPM cards, it takes longer to complete an upgrade because the runtime software must be copied to each RPM card’s bootflash instead of to a single location.

At startup, the RPM card attempts to load the software in the order listed in the startup-config file. The following example shows an excerpt from a startup-config file:

```
!
boot system x:rpm-js-mz_122-4.T
boot system bootflash:rpm-js-mz_122-4.T
boot config c:auto_config_slot09
logging rate-limit console 10 except errors
enable password *****
!
```

Tip The *c:* reference in the previous example refers to the E:RPM directory on the PXM hard disk. When configuring the RPM to store configuration files on E:RPM, enter commands that reference the e: drive. When displaying the configuration, the e: drive is always displayed as c:.

In the startup-config file example, the RPM card attempts to load the runtime software from the PXM card (x:rpm-js-mz_122-4.T) first, and if that fails, it attempts to load the image copy stored in bootflash. This configuration takes longer to upgrade, but it assures the card can reboot if someone accidentally removes the file on the PXM hard disk.

To configure the RPM to load upgraded runtime software from the PXM hard disk, you need to do the following:

- Copy the upgraded file to the PXM hard disk
- Update the boot system variable in the router startup-config file to load the new file.
- Reset the RPM card so that it loads the new file.

RPM cards can be configured for 1:N redundancy as well as for non-redundant configurations. The procedures for both types of configuration are in the sections that follow.

Tip To simplify runtime software updates, copy the runtime file in the C:FW directory and rename it to a generic name such as rpm-js-mz. The production runtime filenames have version numbers appended to them, but you can change this. This approach allows you to perform future upgrades by copying the file to the hard disk, renaming a copy of the file to your generic name, and resetting each card. The approach eliminates the need to reconfigure Cisco IOS commands on each card to recognize the new filename.

Upgrading RPM Runtime Software for 1:N Redundancy

Redundancy must be established before you use the procedure in this section. If redundancy has not been established, upgrade each RPM card using the procedure in the next section, “Upgrading Without Redundancy”.

Note In this document, the general term “RPM” refers for both the RPM-PR and RPM-XF cards. If a step or procedure is specific to only one of the RPM cards, it will be called out in the text.

To upgrade the RPM runtime software for 1:N redundancy, use the following procedure.

Step 1 Copy the new runtime software file for the RPM card to the switch (C:FW) as described in the "Copying Software Files to the Switch" section earlier in this appendix.

Step 2 If you are using a generic filename for your runtime images, copy the file on the PXM hard disk and rename the copy. For example:

```
8850_LA.8.PXM.a > copy rpm-js-mz_122-4.T rpm-js-mz
```

Step 3 Establish a configuration session using any valid user name.

Step 4 If your RPM is already configured to use a file with a generic name, skip to Step 13.

Step 5 Enter the **cc** command to select the RPM card to update.

```
pop20two.7.PXM.a > cc 9

(session redirected)

Router>
```

The switch displays the Cisco IOS prompt for the router on the RPM card. From this point on, all commands are Cisco IOS commands.

Note This procedure assumes that you are familiar with Cisco IOS commands (which are a topic that is beyond the scope of this book). This procedure details only those commands that are unique to setting up RPM on the switch. For general Cisco IOS commands, examples are given to show how to complete the task.

Step 6 Enter Enable mode for the router.

```
Router>enable
Password:
Router#
```

Step 7 Display the startup runtime software filename by entering the **show bootvar** command.

```
Router#show bootvar
BOOT variable = x:rpm-js-mz_122-4.T,12;
CONFIG_FILE variable = c:auto_config_slot09
BOOTLDR variable does not exist
Configuration register is 0x2
```

In the example above, the startup runtime software file is x:rpm-js-mz_122-4.T, and it has a version number attached to it. Another way to view the boot list is to enter the **show startup-config** command and look for the **boot system** commands.

Step 8 Enter the router global configuration mode.

```
Router#config terminal
Enter configuration commands, one per line.  End with CNTL/Z.
```

Step 9 If you need to change the boot system filenames, remove the existing boot list using the **boot system** command as follows:

```
Router(config)# no boot system
```

Step 10 Create a new boot list by entering one or more **boot system** commands as follows:

```
Router(config)# boot system x:filename
```

Replace the filename variable with the name of the new runtime file that was previously transferred to the C:FW directory on the switch. For example:

```
Router(config)# boot system x:rpm-js-mz
```

If you want to enter additional boot system commands, enter them in the order in which you want the RPM card to use them. The following example adds a statement to load from bootflash if the runtime file is not found on the PXM hard disk:

```
Router(config)# boot system bootflash:rpm-js-mz_122-4.T
```

Note Before the RPM card can load runtime software from bootflash, you must copy the runtime software to the bootflash. The procedure for copying files from the PXM hard disk to bootflash is described in the previous section.

Step 11 Exit global configuration mode and save the new configuration.

```
Router(config)#^Z
Router#copy run start
Destination filename [startup-config]?
Building configuration...
[OK]
```

Step 12 To verify the change, enter the **show bootvar** or **show run** commands.

Step 13 Switch to the active PXM card and reset the RPM card. For example:

```
Router#cc 8

(session redirected)

8850_LA.8.PXM.a > resetcd 9
The card in slot number 9, will be reset. Please confirm action
resetcd: Do you want to proceed (Yes/No)? y
```

Step 14 Switch to the secondary card using the **switchredcd** command as follows:

```
8850_LA.8.PXM.a > switchredcd <fromSlot> <toSlot>
```

Replace <*fromSlot*> with the slot number of the primary card. Replace <*toSlot*> with the slot number of the secondary card.

This step makes the secondary card active and resets the primary RPM card. When the primary card resets, it loads the upgraded software.

Step 15 Switch back to the primary card using the **switchredcd** command as follows:

```
8850_LA.8.PXM.a > switchredcd <fromSlot> <toSlot>
```

Replace <fromSlot> with the slot number of the secondary card. Replace <toSlot> with the slot number of the primary card.

This step makes the primary card active and resets the secondary RPM card. When the reset is complete, the secondary card is ready to run the upgraded software.

Step 16 To verify that the router reboot is complete, enter the **dspcds** or **dspcd** <*slot*> commands. The reboot is complete when the card state displays as *Active*. Another way to verify router operation is to enter the **cc** slot command. If you can access the router from the switch prompt, the router reboot is complete.

Step 17 If there are other primary cards with redundant (secondary) cards, repeat this procedure for each primary card.

Upgrading RPM Runtime Software for Non-Redundant Cards

To upgrade the RPM-PR or RPM-XF runtime software for nonredundant cards, use the following procedure.

Note In this document, the general term "RPM" refers for both the RPM-PR and RPM-XF cards. If a step or procedure is specific to only one of the RPM cards, it will be called out in the text.

Step 1 Copy the new runtime software file for the RPM card to the switch (C:FW) as described in the "Copying Software Files to the Switch" section earlier in this appendix.

Tip In the past, this guide recommended transferring files to the E:RPM directory. You can still do this and reference the E:RPM directory by entering e: while in enable mode. However, storing boot and runtime software in the E:RPM directory significantly increases the size of configuration files created with the **saveallcnf** command. E:RPM is still used to store configuration files that should be backed up.

Step 2 If you are using a generic filename for your runtime images, copy the file on the PXM hard disk and rename the copy. For example:

```
8850_LA.8.PXM.a > copy rpm-js-mz_122-4.T rpm-js-mz
```

Step 3 Establish a configuration session using any valid user name.

Step 4 If your RPM is already configured to use a file with a generic name, skip to Step 13.

Step 5 Enter the **cc** command to select the RPM card to update.

```
pop20two.7.PXM.a > cc 9

(session redirected)

Router>
```

The switch displays the Cisco IOS prompt for the router on the RPM card. From this point on, all commands are Cisco IOS commands.

Note This procedure assumes that you are familiar with Cisco IOS commands (which is a topic that is beyond the scope of this book). This procedure details only those commands that are unique to setting up RPM on the switch. For general Cisco IOS commands, examples are given to show how to complete the task.

Step 6 Configure the RPM card to store its configuration on the PXM hard disk by entering the following command:

```
Router> boot config e:auto_config_slot#
```

Step 7 Enter Enable mode for the router.

```
Router>enable
Password:
Router#
```

Step 8 Display the startup runtime software filename by entering the **show bootvar** command.

```
Router#show bootvar
BOOT variable = x:rpm-js-mz_122-4.T,12;
CONFIG_FILE variable = c:auto_config_slot09
BOOTLDR variable does not exist
Configuration register is 0x2
```

In the example above, the startup runtime software file is x:rpm-js-mz_122-4.T, and it has a version number attached to it. Another way to view the boot list is to enter the **show startup-config** command and look for the **boot system** commands.

Step 9 Enter the router global configuration mode.

```
Router#config terminal
Enter configuration commands, one per line.  End with CNTL/Z.
```

Step 10 If you need to change the boot system filenames, remove the existing boot list using the **boot system** command as follows:

```
Router(config)# no boot system
```

Step 11 Create a new boot list by entering one or more **boot system** commands as follows:

```
Router(config)# boot system x:filename
```

Replace the filename variable with the name of the new runtime file that was previously transferred to the C:FW directory on the switch. For example:

```
Router(config)# boot system x:rpm-js-mz
```

If you want to enter additional boot system commands, enter them in the order in which you want the RPM card to use them. The following example adds a statement to load from bootflash if the runtime file is not found on the PXM hard disk:

```
Router(config)# boot system bootflash:rpm-js-mz_122-4.T
```

Note Before the RPM card can load runtime software from bootflash, you must copy the runtime software to the bootflash. The procedure for copying files from the PXM hard disk to bootflash is described in the previous section.

Step 12 Exit global configuration mode and save the new configuration.

```
Router(config)#^Z
Router#copy run start
Destination filename [startup-config]?
Building configuration...
[OK]
```

Step 13 To verify the change, enter the **show bootvar** or **show run** commands.

Step 14 Switch to the active PXM card and reset the RPM card. For example:

```
Router#cc 8

(session redirected)

8850_LA.8.PXM.a > resetcd 9
The card in slot number 9, will be reset. Please confirm action
resetcd: Do you want to proceed (Yes/No)? y
```

Troubleshooting Upgrade Problems

Table A-4 lists symptoms of upgrade problems and suggestion on how to correct them.

Tip When troubleshooting problems on standby PXM cards or cards that do not start up to the active state, establish communications through the boot IP address or through the console port.

Table A-4 Troubleshooting Upgrade Problems

Primary Symptom	Secondary Symptom	Suggested Action
loadrev or **runrev** command fails	—	The **loadrev** command is blocked when a previous upgrade has not been completed with the **commitrev** command. Enter the **dsprevs** command to locate the cards that are still being upgraded. For more information on a particular card, enter the **dspcd** <*slot*> command and verify that the current, primary, and secondary software revision numbers are identical. If the numbers are not identical, issue the **commitrev** <*slot*> command. Enter the **dspcds** and verify that the standby card is in standby state. Also look for a -U or -D in the **dspcds** command display, which indicates that the card is in the process of being upgraded (-U) or downgraded (-D). The **loadrev** and **runrev** commands are blocked whenever the standby card is not in standby state or an upgrade or downgrade is in progress.
After restart, the switch stops displaying messages and does not display a prompt.	—	Press **Return** to display the prompt.

Table A-4 Troubleshooting Upgrade Problems (continued)

Primary Symptom	Secondary Symptom	Suggested Action
After restart, switch stops at backup boot prompt: pxm1ebkup> or pxm45bkup. (Use a console port connection to see this. If you missed the startup messages, enter the **reboot 2**[1] command.)	The switch displays the following message: *Can not open file C:/version*.	The version file is probably missing. Create the version file as described in the "Initializing the Switch" section in Chapter 2, "Configuring General Switch Features."
	The switch displays the following message: *Unable to determine size of C:/FW/filename*.	The version recorded in the version file doesn't match software installed in the C:FW directory. Enter the **sysVersionShow** command to see which file the PXM is trying to load. Verify that the correct software is installed on the switch using the commands described in the "Browsing the File System in Backup Boot Mode" section in Appendix B, "PXM Backup Boot Procedures." If the runtime software is not on the hard disk, copy it to the hard disk as described in the "Transferring Software Files to and from the Switch" section in Appendix B, "PXM Backup Boot Procedures." If a typo is entered when initializing the switch, re-enter the **sysVersionSet** command, enter the **sysVersionShow** command to verify the correct setting, and then reboot the switch with the **reboot 2**[1] command.
	The switch displays the following message: *Please run sysDiskCfgCreate*.	The hard disk is formatted, but not ready for operation. Enter the **sysDiskCfgCreate** command. For more information, see the "Initializing the PXM Hard Disk" section in Appendix B, "PXM Backup Boot Procedures."
Standby PXM continually reboots. You can view the rebooting process through the console port.	—	The active PXM card cannot bring up the standby card. The following procedure assumes that this card has just been installed in the switch and that you have given the standby card sufficient time to synchronize with the Active card. Interrupt the boot cycle by pressing **Return**. Timing is important, so you might have to press **Return** multiple times. When the pxm1ebkup or pxm45bkup prompt appears, immediately enter the **sysPxmRemove** command to prevent the Active card from rebooting the standby card while you are working on it. Enter the **sysChangeEnet** command and verify that the *inet on ethernet (e)* and *gateway inet (g)* values are set to the boot and gateway IP address set with the **bootChange** command on the active card. Also, verify that the *boot device* is set to *lnPci*. The **sysChangeEnet** command works like the bootChange command, which is described in the "Setting the Boot IP Address" section in Chapter 2, "Configuring General Switch Features." Enter the **sysClrallcnf** command to clear any configuration data on the standby card set. This command does not clear the boot IP address set with the **sysChangeEnet** command.

Table A-4 Troubleshooting Upgrade Problems (continued)

Primary Symptom	Secondary Symptom	Suggested Action
After restart, the switch stops at shell prompt: pxm1e> or pxm45>.	—	If the **Return** key is pressed at one of the auto-boot prompts during start up, the switch stops in shell mode. Enter the **reboot 2**[1] command to restart the switch and avoid pressing the **Return** key.
The non-active PXM will not transition out of the active init state.	One or more non-standby PXM cards are in a transitional state.	A non-standby PXM card is a standalone PXM card or the card within a redundant PXM pair that is trying to go active. When a non-standby PXM card is in a transitional state, such as the init state, the PXM cannot transition to the standby state. When all non-standby cards have reached a steady (non-transitional) state, the PXM will transition to a steady state. Steady states are as follows: active ready, failed, mismatch, empty, empty reserved, and standby ready. **Note** When either card in a redundant PXM pair is active, that PXM pair is not preventing the standby PXM from transitioning to a steady state. The standby PXM is only affected when both cards in a redundant pair are in a transitional state.

1. Beginning with Release 4.0, you must enter **reboot 2**. For all prior releases, enter **reboot**.

APPENDIX B

PXM Backup Boot Procedures

When a PXM card starts up, it first loads the boot software on the card. If the PXM cannot load the runtime firmware, the card continues to run the boot software in what is called *backup boot* mode. The backup boot prompt is as follows:

- *pxm1ebkup>* for PXM1E
- *pxm45bkup>* for PXM45

Some switch procedures, such as PXM card initialization and boot software upgrades, must be performed in backup boot mode. This appendix describes the following procedures:

- Changing to PXM Backup Boot Mode
- Browsing the File System in Backup Boot Mode
- Locating Software Updates
- Transferring Software Files to and from the Switch
- Clearing the Switch Configuration
- Initializing the PXM Hard Disk

Changing to PXM Backup Boot Mode

You must enter PXM backup boot mode to perform certain configuration procedures such as burning boot software. The following procedure describes how to switch to backup boot mode.

Step 1 If you have not done so already, establish a CLI session with the PXM card using the CP port on the PXM-UI-S3 or PXM-UI-S3/B back card and a user name with CISCO_GP privileges.

> **Note** A CP port session is required because you will be resetting the node and entering commands in “Backup Boot mode,” which is not accessible through other connection methods.

Step 2 At the switch prompt, enter the **sh** command to switch to the PXM shell mode.

```
mgx8850a.7.PXM.s > sh
```

The switch will display the shell mode prompt, which is either *pxm1e>* or *pxm45>*.

Step 3 At the shell prompt, enter the **sysBackupBoot** command

```
pxm1e> sysBackupBoot
```

Note This command and all commands that you enter in shell mode are case sensitive.

The PXM card reboots after you enter this command.

Tip If you are accessing the CP port through a terminal server, rebooting the PXM may disrupt your connection. Random characters may appear on the display or the display may appear to "hang." If this happens, use your terminal software command to reset the terminal connection. After a successful reset, switch status messages should start appearing on the display.

When the reboot is complete, a PXM Backup Boot banner appears.

Step 4 When the PXM Backup Boot banner appears, press return to display the backup boot prompt, which is either *pxm1ebkup>* or *pxm45bkup>*.

When the backup boot prompt appears, you are in backup boot mode.

Caution Some backup boot mode commands, such as debug commands, can consume switch resources and reduce switch performance. Cisco Systems, Inc., recommends that you only execute backup boot commands described in the product documentation. Experimenting with some commands can degrade switch performance or interrupt switch operation completely.

Step 5 If the PXM you restarted is the standby card for an active PXM card in the same switch, enter the **sysPxmRemove** command to prevent the active card from restarting the card you on which you are working.

Tip To display a list of commands available in backup boot mode, enter the **help** command.

Browsing the File System in Backup Boot Mode

The PXM hard disk stores log files, configuration files, and boot and runtime software. The switch operating system supports a set of UNIX-like commands that you can use to locate log files or manage software updates. Many of the commands are the same commands that operate at the switch prompt, however, in backup boot mode you must enclose the file path in quotation marks. Table B-1 lists commands that you can use to browse the file system.

Note File and directory names in the switch file system are case sensitive.

Table B-1 File System Commands at Backup Boot Prompt

Command	Description
cd	Change directories. Syntax: **cd** “<*path*>” Example: **cd** “C:FW”
copy	Copies a file from one location to another. Syntax: **copy** “<*source file name*>”, “<*destination file name*>” Example: **copy** “C:FW/pxm1e_002.001.000.000_bt.fw”, “C:FW/test”
remove	Deletes a file. Syntax: **remove** “<*file name*>” Example: **remove** “test”
ll	List directory contents using long format, which includes the name, size, modification date, and modification time for each file. This command also displays the total disk space and free disk space. Syntax: **ll** [“*path*”] Example: **ll** “C:FW” **Note** When you first start a session in backup boot mode, the present working directory is a directory on a remote server as specified by the runtime software **bootChange** command. If you enter the **ll** command and the remote server is unavailable or does not exist, the switch appears to hang as the switch attempts to access the remote server. To avoid this, select a directory on the C: drive with the **cd** command first or specify a path with the **ll** command. To reboot the PXM card when it is searching for a remote server, press **Control-X**.
ls	List directory contents using the short format, which displays filenames, total disk space, and free disk space. Syntax: **ls** [“*path*”] Example: **ls**
pwd	Display the present working directory. When you first start a session in backup boot mode, the present working directory is a directory on a remote server as specified by the runtime software **bootChange** command. To change to a directory on the C: drive, enter the **cd** command. Syntax: **pwd** Example: **pwd**
rename	Renames a file. Syntax: **rename** “<*old file name*>”, “<*new file name*>” Example: **rename** “test”, “deleteme”
whoami	Lists the login name for the current session. Since there is no user login procedure for backup boot mode, the username reported by the **whoami** command is the username configured by the runtime software **bootChange** command for remote server access. Syntax: **whoami** Example: **whoami**

Locating Software Updates

For information on locating software updates, refer to the *Release Notes for Cisco MGX 8850 (PXM1E/PXM45), Cisco MGX 8950, and Cisco MGX 8830 Switches, Release 5.0.00* and the *Release Notes for the Cisco MGX 8880 Media Gateway, Release 5.0.00*.

Transferring Software Files to and from the Switch

This section describes how to copy software files between the switch and another computer when the switch is in backup boot mode. In most cases, you will use this procedure because the switch cannot completely load the runtime software and ends start up in either backup boot mode or shell mode.

Note When the switch displays the switch prompt (which includes the switch name), copy files to the switch using the procedure described in "Copying Software Files to the Switch" in Appendix A, "Downloading and Installing Software Upgrades."

The Cisco Cisco MGX switches provide a File Transfer Protocol (FTP) service to support file transfers between the switch and other computers. If you have FTP client software and network connectivity to both the switch and the server where the software files are stored, you can FTP files directly from the server to the switch. You can also use this FTP service to recover log files. boot and runtime files, or saved configuration files before replacing the hard disk.

To transfer files with the FTP service, use the following procedure.

Step 1 If you are copying software files to the switch, refer to the *Release Notes for Cisco MGX 8850 (PXM1E/PXM45), Cisco MGX 8950, and Cisco MGX 8830 Switches*, *Release 5.0.00* or the *Release Notes for the Cisco MGX 8880 Media Gateway*, *Release 5.0.00* to locate a server from which you can download the files.

Step 2 Using a workstation with FTP client software, establish connections to the server where the files are stored and to the switch.

The procedure you use for transferring the files depends on the FTP client software you are using. When initiating the FTP connection, remember the following statements:

- Select the switch by entering its IP address.
- When prompted for a username and password, the username for backup boot mode access is *cisco* and the password is *ciscoinc*.

Step 3 For all transfers to or from the switch, select binary mode for the file transfer. The files are located in the following directories:

- PXM, SRM, and service module files are in the directory C:FW.
- Log files are in the directory C:LOG.
- Configuration files are in the directory C:CNF.
- RPM-PR and RPM-XF files are stored in the E:RPM directory.

Step 4 To verify that files have been transferred to the switch, use the directory commands listed in the "Browsing the File System in Backup Boot Mode" section earlier in this appendix.

Clearing the Switch Configuration

To clear the entire switch configuration, use the **sysClrallcnf** command. This command clears all the provisioning data and most of the general switch configuration parameters, such as the switch name and SNMP configuration.

Initializing the PXM Hard Disk

If the switch troubleshooting process indicates that the PXM hard disk is not operating correctly, you can try to correct the problem by re initializing the hard disk as described in the following procedure.

Step 1 Establish a backup boot session on the PXM that connects to the affected hard disk as described in the"Changing to PXM Backup Boot Mode" section earlier in this chapter.

Step 2 Start a disk format by entering the **diskFormat** command as shown in the following example:

```
pxm1ebkup>diskFormat "C:"
IDE: format in progress. This takes a while  ........
```

When the format is complete, a message similar to the following example appears:

```
Disk format complete. Reboot the system  .....
"C:" formatted.
value = 0 = 0x0
```

Step 3 Enter the **reboot 2** command to restart the card.

Step 4 When the *stop auto-boot* prompt appears, press **return** to enter backup boot mode. The following example shows the prompt and the message that appears when a newly formatted hard disk is detected.

```
Press Return key to stop auto-boot...2

To avoid reset from the Active card, use sysPxmRemove()
Use sysFWLoad() for FW download from active PXM.
*********************************************************
*    Disk does not have valid configuration.            *
*    Please run sysDiskCfgCreate(), and then reboot.    *
*********************************************************
pxm1ebkup>
```

Step 5 If the PXM you restarted is the standby card for an active PXM card in the same switch, enter the **sysPxmRemove** command to prevent the active card from restarting the card you are working on.

Step 6 Enter the **sysDiskCfgCreate** command to set up the PXM hard disk.

Step 7 If this is a standalone PXM card, copy the runtime and boot software files to the switch as described in the "Transferring Software Files to and from the Switch" section earlier in this appendix.

Step 8 Enter the **reboot** command to restart the card.

Step 9 If this is a standalone PXM card, set up the switch as if it were a new switch as described in the "Configuration Quickstart" section in Chapter 2, "Configuring General Switch Features."

Step 10 If this is a standby PXM card, the active PXM card will update the newly-formatted hard disk with the active configuration. When the update is complete, the card will enter standby mode and the switch prompts you for a user name and password. Enter the user name and password to log in. After login, the switch prompt should include the letter s, indicating the card is operating in standby mode. For example:

```
pop20one.8.PXM.s >
```

Note The switch prompt might initially display the letter i for initialization. Press **Return** to display an updated switch prompt or enter the **dspcds** command several times until the switch prompt or the **dspcds** command display shows the card is operating in standby mode. The card must complete initialization before entering standby mode.

APPENDIX C

Supporting and Using Additional CLI Access Options

The command line interface (CLI) management tool allows you to configure the MGX switches and display the switch status. When a switch starts up for the first time, the only CLI access available is through the console port (CP). After the switch is properly configured, you can access the CLI using any of the following:

- CP connection
- Terminal server connection
- Local LAN connection
- Dial-up connection
- ATM WAN connection

The following sections describe how to prepare the switch for the different types of CLI access and how to access the switch using these access methods.

Setting Up CP Port Connections

The Console Port (CP) connection requires no configuration on the switch. Figure C-1 shows the hardware required for a console port connection to a PXM45 UI-S3 back card.

Figure C-1 Workstation Connection to the Console Port

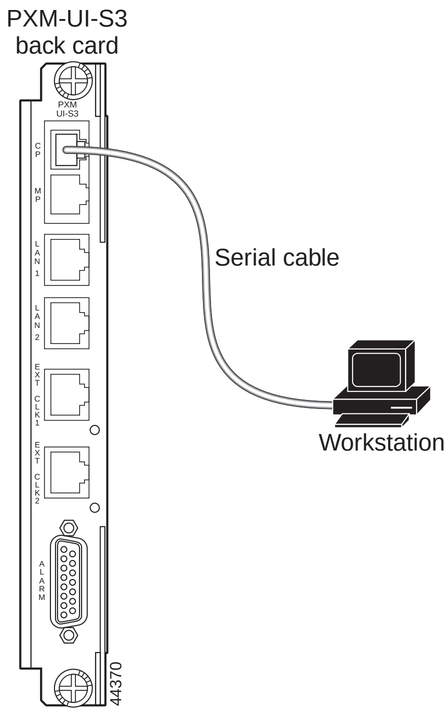
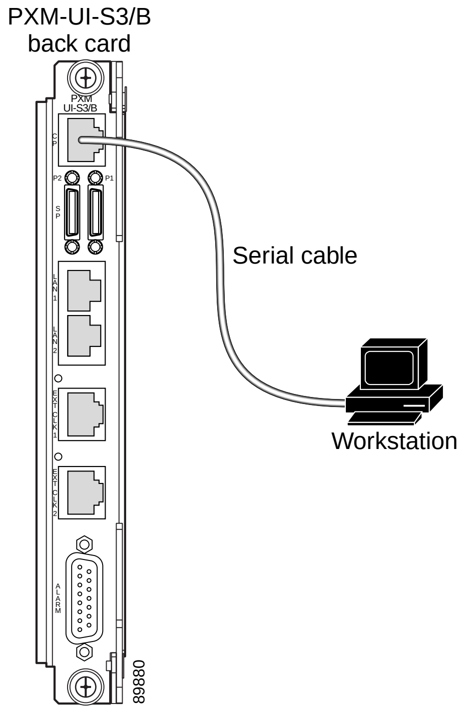


Figure C-2 shows the hardware required for a console port connection to a PXM1E UI-S3/B back card.

Figure C-2 Workstation Connection to Console Port on a PXM-UI-S3/B Back Card



The terminal you use should emulate a VT-100 terminal. You can use any personal computer or UNIX workstation and a terminal emulation program that emulates the VT-100.

The default switch configuration supports the following settings: 9600 bps, 8 data bits, no parity, 1 stop bit, no hardware flow control.

Setting Up Terminal Server Connections

A terminal server connection allows remote access to the CP port. Figure C-3 shows the hardware required for a terminal server connection.

Figure C-3 Terminal Server Connection to the Console Port on a PXM45 UI-S3 Back Card

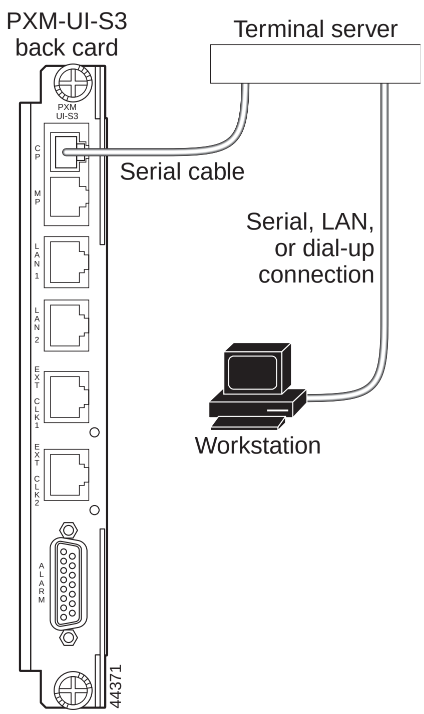
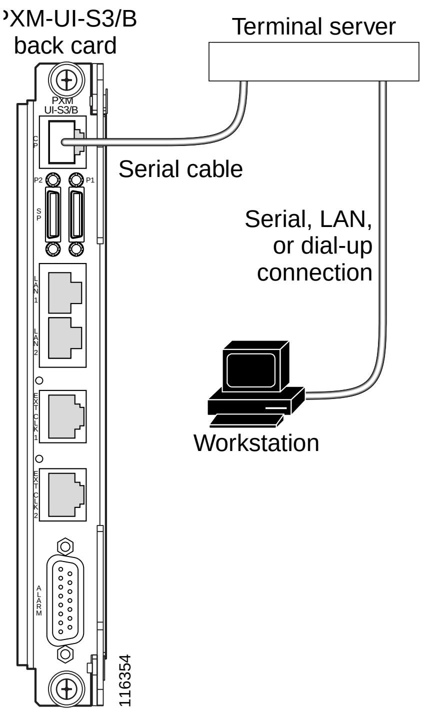


Figure C-4 shows the hardware required for a terminal server connection.

Figure C-4 Terminal Server Connection to the Console Port on a PXM1E UI-S3/B Back Card



In the terminal server topology, any workstation with access to the terminal server can access the CP port as if the workstation were local. When the switch is operating properly, a terminal server connection offers no advantage over the other access methods. When the switch is not operating properly, however, other access methods might not function. In these situations, the CP port is more likely to operate than the other methods because it does not require IP connectivity to the workstation.

No special switch configuration is required to support a terminal switch configuration. The connection between the terminal server and the switch is a serial connection, which is the same as for a CP port connection. The following configuration tasks need to be completed at the terminal server:

- The serial port to the switch must be enabled and configured.
- A second interface must be defined and configured for workstation access.

The workstation interface can be any interface type that both the workstation and the terminal server support. For example, the workstation interface could be an Ethernet interface for local LAN access, or it could be a dial-in interface for remote access.

To access the switch through the terminal server, the workstation establishes a connection to the terminal server using a terminal emulation program. After connecting to the terminal server, the workstation user enters a command that selects the serial port to the switch. Once the correct port is selected, the user logs in to the switch as if the user were using a CP port connection.

Setting Up Local LAN Connections

The procedure for setting up local LAN connections is described in Chapter 2, "Configuring General Switch Features" in the following sections:

- "Setting the Boot IP Address"
- "Setting the Disk IP Address"

Setting Up Dial-Up Connections

A dial-up connection extends switch management to all workstations that have access to the Public Switched Telephone Network. Figure C-5 shows the hardware required for a dial-up connection to a PXM45 UI-S3 back card.

Figure C-5 Hardware Required for Dial-up Connection to a PXM45 UI-S3 Back Cards

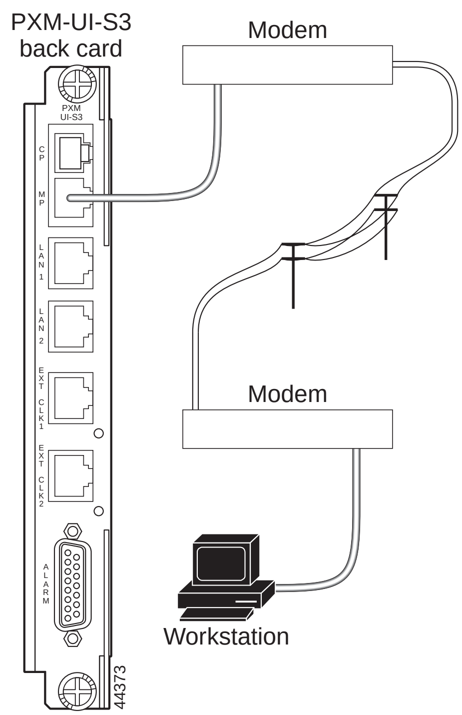
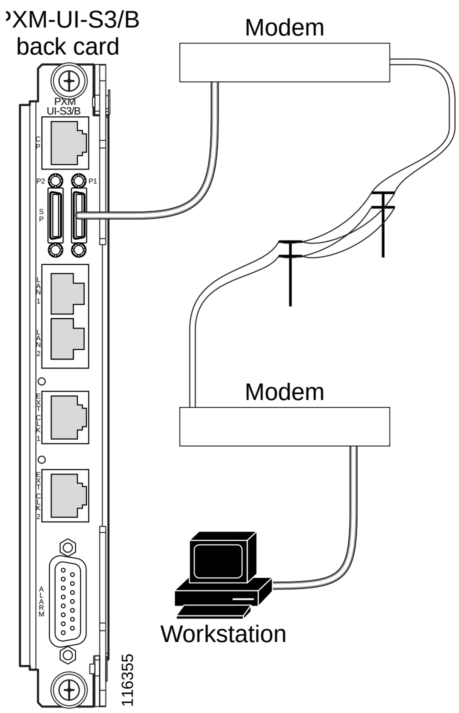


Figure C-6 shows the hardware required for a dial-up connection to a PXM1E UI-S3/B back card.

Figure C-6 Hardware Required for Dial-up Connections on a PXM1E UI-S3/B Back Card



Before you can manage the switch using the dial-up interface, you must first assign an IP address to the maintenance port on the switch. This maintenance port is located on the PXM back card. For more information on physically connecting a modem to the maintenance port, refer to the *Cisco MGX 8850 (PXM1E/PXM45), Cisco MGX 8950, Cisco MGX 8830, and Cisco MGX 8880 Hardware Installation Guide, Releases 2 Through 5*.

To configure an IP address on the switch maintenance port, use the following procedure.

Step 1 Establish a CLI management session using a username with SUPER_GP privileges. The default user name and password for this level are *superuser*, <*superuser*>.

Step 2 Verify that the IP address is not already configured by entering the following command:

```
mgx8850a.7.PXM.a> dspipif sl0
```

Note If you omit the **sl0** option, the switch displays the configuration for all switch IP interfaces: the ATM interface (atm0), the PXM LAN port interface (lnPci0), and the PXM maintenance port interface (sl0). Note that the address for each interface must be unique.

In the IP Interface Configuration Table, look for an Internet address entry under the **sl0** entry. (You may need to press **Enter** to see this.) If an IP address is configured, you can use that address and skip the rest of this procedure. However, if the address has not been entered or is incompatible with your network, you must configure a valid IP address as described in the next step.

Step 3 To set the IP address for the maintenance port, enter the **ipifconfig** command using the following format:

```
mgx8850a.7.PXM.a> ipifconfig sl0 <IP_Addr> <netmask Mask>
```

Replace <*IP_Addr*> with the IP address you want this port to use, and replace <*Mask*> with the network mask used on this network.

Tip Cisco recommends that you use the same subnet for all IP addresses defined on all MGX 8850 switches. This simplifies router configuration.

Note There are other options for the **ipifconfig** command, and you can set one or more options simultaneously. Any options you do not define in a command remain unchanged. For more information on this command, refer to the *Cisco MGX 8850 (PXM45/PXM1E), Cisco MGX 8950, Cisco MGX 8830, and Cisco MGX 8880 Command Reference, Release 5*.

After you complete this procedure, the switch is ready for configuration through the maintenance port.

Configuring the Switch

To support IP connectivity over the ATM interface, you need to do the following tasks:

1. Assign an IP address to the ATM interface.
2. Assign an AESA to the ATM interface.
3. Define an AESA for every adjacent router that supports IP communications to the ATM interface.
4. Configure ATM communications between the switch and the router.

To configure the switch to support IP connectivity to the ATM interface, use the following procedure.

Step 1 Establish a CLI management session using a username with SUPER_GP privileges. The default user name and password for this level are *superuser*, <*superuser*>.

Step 2 Verify that the IP address for the ATM interface is not already configured by entering the following command:

```
mgx8850a.7.PXM.a> dspipif atm0
```

Note If you omit the **atm0** option, the switch displays the configuration for all switch IP interfaces: the ATM interface (atm0), the PXM LAN port interface (lnPci0), and the PXM maintenance port interface (sl0). Note that the address for each interface must be unique.

In the IP Interface Configuration Table, look for an Internet address entry under the atm entry. If an IP address is configured, you can use that address. However, if the address has not been entered or is incompatible with your network, you must configure a valid IP address as described in the next step.

Step 3 To set the switch IP address for the ATM interface, enter the **ipifconfig** command using the following format:

```
mgx8850a.7.PXM.a> ipifconfig atm0 <IP_Addr> <netmask Mask>
```

Replace <*IP_Addr*> with the IP address you want this port to use, and replace <*Mask*> with the network mask used on this network.

Note Use a subnet mask that is different from the network mask used for LAN port communications. If you use the same subnet for both ATM and LAN port communications, there will be two entries for the same subnet in the routing table and all egress IP communications will take place through the atm0 port.

Tip Cisco recommends that you use the same subnet for all atm0 IP addresses defined on all MGX 8850 switches. This practice simplifies router configuration.

Note There are other options for the **ipifconfig** command, and you can set one or more options simultaneously. Any options you do not define in a command remain unchanged. For more information on this command, refer to the *Cisco MGX 8850 (PXM45/PXM1E), Cisco MGX 8950, Cisco MGX 8830, and Cisco MGX 8880 Command Reference, Release 5*.

Step 4 To verify the IP address you configured, enter the following command:

```
mgx8850a.7.PXM.a> dspipif atm0
```

Step 5 Make a note of the IP address defined for the atm0 interface. This is the IP address switch administrators must use to manage the switch.

Step 6 Configure the switch AESA for IP connectivity by entering the following command:

```
mgx8850a.7.PXM.a> svcifconfig atm0 local <ATM_Addr>
```

Replace *ATM_Addr* with the AESA for the interface. This address must conform to the address plan for the switch.

Step 7 Define the AESA for the ATM router by entering the following command:

```
mgx8850a.7.PXM.a> svcifconfig atm0 router <ATM_Addr>
```

Replace <*ATM_Addr*> with the AESA for the interface. This address must conform to the address plan for the switch.

Step 8 To verify the ATM addresses you configured, enter the following command:

```
mgx8850a.7.PXM.a> dspsvcif
```

Step 9 If you have not already done so, configure the PNNI controller as described in the "Adding the PNNI Controller" section in Chapter 2, "Configuring General Switch Features."

Step 10 Configure the ATM line to the ATM router as described in the "PNNI UNI Port Configuration Quickstart" section in Chapter 3, "Provisioning PXM1E Communication Links."

The line configuration should specify a UNI port, SCT 6, and a partition that supports at least 20 connections.

Step 11 To verify connectivity to directly attached ATM routers, enter the **dsppnsysaddr** command.

The ATM addresses of directly attached ATM routers should appear in the list the switch displays. To display an ATM address for a remote router, you need to establish a CLI session on the remote switch and enter the **dsppnsysaddr** command.

Step 12 To check the status of ports leading to directly-attached ATM routers, enter the **dsppnports** command.

The following example shows commands that you can use to configure a Cisco
Cisco MGX 8850 (PXM1E/PXM45) or Cisco MGX 8830 for IP communications over ATM.

Example C-1 Switch Commands for IP Communications over ATM

```
mgx8850a.7.PXM.a> ipifconfig atm0 A.B.E.F    # Replace A.B.E.F with IP Address
mgx8850a.7.PXM.a> svcifconfig atm0 local
47.0091.8100.0000.0010.7b65.f258.0010.7b65.1111.01
mgx8850a.7.PXM.a> svcifconfig atm0 router
47.0091.8100.0000.0010.7b65.f258.0010.7b65.ffff.f1
mgx8850a.7.PXM.a> addcontroller 2 i 2 7 #if controller does not already exist
mgx8850a.7.PXM.a> cnfcdsct 6
mgx8850a.7.PXM.a> upln 1.1
mgx8850a.7.PXM.a> addport 1 1.1 96000 96000 6 1
mgx8850a.7.PXM.a> addpart 1 1 2 500000 500000 500000 500000 1 20 32 52 1 20
mgx8850a.7.PXM.a> upport 1
mgx8850a.7.PXM.a> cnfilmi -if 1 -id 1 -ilmi 1 -vpi 0 -vci 16 -trap 1 -s 10 -t 10 -k 10
#Optional. This command configures ILMI for the port.
mgx8850a.7.PXM.a> addaddr 10:1.1:1 47.0091.8100.0000.0010.7b65.f258.0010.7b65. ffff.f1 160
#Enter only at switch with direct connection to router. Omit if using ILMI.
mgx8850a.7.PXM.a> dsppnsysaddr

(example output)
47.0091.8100.0000.0010.7b65.f258.0010.7b65.ffff/152
Type:      uni     Port id:   17111041

mgx8850a.7.PXM.a> dsppnports

(example output)
Per-port status summary

PortId         IF status         Admin status       ILMI state       Total Activeconns

10:1.1:1        up                up                 Undefined        3
```

Configuring the Router

To support IP over ATM communications on the ATM router, you need to configure the following interfaces:

- ATM interface to switch
- Interface to the LAN that hosts the management workstation

To configure the ATM interface to the switch, you need to do the following tasks:

- Create an ATM interface
- Assign an IP address to the ATM interface
- Assign an AESA to the ATM interface
- Configure the ATM interface to be the ATMARP server for the switch

If the router IP address for the ATM interface is on the same subnet as the IP address on the switch ATM interface, no additional configuration is required for the router IP LAN interface.

To configure the IP interface to the LAN, you need to do the following:

- If the router IP address for the ATM interface is not on the same subnet as the IP address on the switch ATM interface, you must manually configure on IP host-route for each MGX switch to which the interface will connect.
- Configure a routing protocol to broadcast the switch IP addresses to the LAN or create default routes to the switch on the management workstation.

The procedure you use to configure the ATM router will depend on the router you are using. The following example lists commands you can use on a Cisco router to support IP over ATM communications with the Cisco MGX switch.

Example C-2 Router Configuration Commands for IP Communications over ATM

```
config term
ip routing
ip route 0.0.0.0 0.0.0.0 W.X.Y.Z 1 (set default route)
interface atm 0
ip address A.B.C.D G.H.I.J   # G.H.I.J = netmask
atm nsap-address 47.0091.8100.0000.0010.7b65.f258.0010.7b65.ffff.f1
atm uni-version 3.1
atm pvc 1 0 5 qsaal
atm pvc 2 0 16 ilmi #Optional. Enter to enable ILMI.
atm ilmi-keepalive 10 #Optional. Enter to configure ILMI.
atm esi-address 00107B65FFFF.F1 #Optional. Enter to support ILMI.
atm arp-server self
no shut
^Z
write memory
```

Starting a CLI Management Session Using a CP Port or Terminal Server Connection

The process for starting a CLI management session is similar for both CP port and terminal server connections. Both use a serial connection to the switch. The difference is that terminal server connections require that you first select the correct port at the terminal server.

After switch initialization, you can terminate and start sessions at any time using the terminal or workstation connection to the CP port or terminal server.

To start a CLI management session for CP port and terminal server connections, use the following procedure.

Step 1 Turn on the terminal or start the terminal session.

For instructions on preparing the terminal and the connection, refer to the procedure in the previous section.

Step 2 If you are accessing the switch through a terminal server, enter the commands that allow you to select the serial port that leads to the switch.

The following example shows the commands that accomplish this on a Cisco 2509-RJ Router.

```
User Access Verification

Password:
router>telnet 10.1.1.1 2001
Trying 10.1.1.1, 2001 ... Open

Login:
```

In the example above, the user first logs into the terminal server and then establishes a Telnet session to the terminal server using port 2001. All workstation communications pass through the Telnet server on the terminal server and out the serial connection designated by port 2001.

Note The built-in Telnet server on the switch, which is used by the other access methods, is not used for this type of connection.

Step 3 If the Login prompt does not appear, press **Return**. The Login prompt comes from the switch and indicates that the terminal has successfully connected to the switch.

Step 4 When the Login prompt appears, enter the login name supplied with your switch, and then enter the password for that login name. For example:

```
Login: superuser
password:

pop20one.7.PXM.a >
```

The switch does not display the password during login. When login is complete, the switch prompt appears, you have established a CLI management session, and you are ready to begin switch configuration and monitoring.

Starting a CLI Telnet Session

Start a CLI Telnet session when you start a CLI management session using any of the following access methods, all of which require an IP address:

- Local LAN connection
- Dial-up connection
- ATM WAN connection

The switch includes a Telnet server process that you can use to connect to and manage the switch. Before you can establish a CLI Telnet session, you must set up the hardware for your access method and configure the switch as described earlier in the appendix.

After the appropriate interface has been configured and a physical path established to the MGX switch, you can start a CLI session using a workstation with a Telnet client program and the switch IP address. To establish a CLI management session, use the following procedure.

Step 1 If you are dialing into the switch, establish a dial-up connection to the switch.

You will need the telephone number for the line connected to the modem at the switch. For instructions on establishing the connection to the switch, refer to the documentation for the workstation and modem.

Step 2 When the workstation has a path to the switch, start the Telnet program with a command similar to the following example:

```
C:>telnet <ipaddress>
```

Replace <*ipaddress*> with the IP address assigned to the switch. If the switch is configured to support multiple access methods, be sure to use the correct IP address for the access method you are using. For example, if you are using the local LAN access method, use the IP address configured for the lnPCI0 interface.

Note Note that the Telnet program on your workstation may require a different startup and connection procedure. For instructions on operating your Telnet program, refer to the documentation for that product.

Step 3 If the Login prompt does not appear, press **Enter**.

The Login prompt comes from the switch and indicates that the workstation has successfully connected to the switch.

Step 4 When the Login prompt appears, enter the user name provided with your switch and press **Enter**.

Step 5 When the password prompt appears, enter the password provided with your switch and press **Enter**.

After you successfully log in, a prompt appears that is similar to the following example:

```
mgx8850a.7.PXM.a >
```

The switch does not display the password during login. When the login is complete, the switch prompt appears, you have established a CLI management session, and you are ready to begin switch configuration and monitoring.

Starting a Secure (SSH) CLI Session

A secure CLI session uses the SSH protocol to encrypt all communications between a management workstation and the switch. This keeps the user ID, the password, and the details of your management session private.

Beginning with Release 5, Cisco MGX switches include an SSH server which is enabled by default. To establish a secure CLI session, you need to acquire SSH client software (which is not provided) and configure it for access to the server. The SSH secure session feature supports the following:

- Up to 12 simultaneous secure sessions on a switch
- Simultaneous SSH protocol version 1 (SSHv1) and version 2 (SSHv2) support
- Support for password authentication and public-key authentication

- Support for RSA (SSHv1) and DSA (SSHv2) key authentication algorithms
- Support for AES, 3DES, and Blowfish encryption methods
- Support for hmac-sha1 and hmac-md5 hashing methods
- SSH server support for accessing MGX CLI
- SSH client support for accessing remote SSH servers

Tip For instructions on establishing a secure session between switches, see "Starting and Managing Secure (SSH) Access Sessions Between Switches" in Chapter 9, "Switch Operating Procedures."

You can establish a secure CLI management session using any of the following access methods, all of which require an IP address:

- Local LAN connection
- Dial-up connection
- ATM WAN connection

Before you can establish a secure CLI management session, you must set up the hardware for your access method and configure the switch as described earlier in the appendix. After the appropriate interface has been configured and a physical path established to the MGX switch, you can start a secure CLI session using a workstation with a SSH client program and the switch IP address. To establish a CLI management session, use the following procedure.

Note If your IP configuration supports it, you can establish a secure session with the active or the standby PXM. For more information, see "Guidelines for Creating an IP Address Plan" in Chapter 1, "Preparing for Configuration."

Step 1 If you are dialing into the switch, establish a dial-up connection to the switch.

You will need the telephone number for the line connected to the modem at the switch. For instructions on establishing the connection to the switch, refer to the documentation for the workstation and modem.

Step 2 When the workstation has a path to the switch, start the SSH client program.

Note The SSH client program requires that you enter the switch IP address, a user ID, and a password. Most client programs can store configurations so that future connections require that you select a configuration, click *Connect*, and enter your password. For details on how to configure and connect to an SSH server such as the Cisco MGX switch, refer to the documentation for your SSH client.

When you have successfully established a secure CLI session, the SSH client will display information similar to the following:

```
SSH Secure Shell 3.2.0 (Build 267)
Copyright (c) 2000-2002 SSH Communications Security Corp - http://www.ssh.com/

This copy of SSH Secure Shell is a commercial version
licensed to Cisco IT, Cisco Systems.




PXM1E_SJ.7.PXM.a >
```

Step 3 If the switch prompt does not appear, press **Enter**.

The switch prompt comes from the switch and indicates that the workstation has successfully connected to the switch. When the SSH Secure Shell message appears with the switch prompt, you have established a secure CLI management session, and you are ready to begin switch configuration and monitoring.

Ending a CLI Management Session

CLI management sessions automatically terminate after the configured idle time. The default idle time is 600 seconds (10 minutes) and can be changed with the **timeout** command. To end a CLI management session, enter the **bye** command.

Note This command ends a CLI, SSH, or Telnet TCP session. It does not terminate the connection to the switch. For example, the **bye** command does not terminate a dial-up connection, a terminal server connection, a local LAN connection, or an ATM WAN connection. The connection remains in place until you terminate it using the terminal emulation software or Telnet client software. Some client software packages include commands to terminate the connection, and most client software packages close connections when you quit the program.

If you have not terminated a nonTCP connection after entering the **bye** command, you can restart a CLI management session by pressing **Return**. After you press **Return**, the switch prompts you for a username and password. The **bye** command terminates a TCP connection, so you must reestablish a TCP connection before you can restart a CLI management session.

APPENDIX D

Standards Compliance

This appendix lists the relevant technical and compliance specifications for Release 5 of the Cisco MGX 8830, Cisco MGX 8850 (PXM1E/PXM45), and Cisco MGX 8950 switches, and the Cisco MGX 8880 Media Gateway in the following sections:

- PNNI Compliance
- ATM Signaling Compliance
- Processor Switching Module Specifications
- UNI 4.0
- AINI 3.0 and 3.1

Note This appendix is *not* a comprehensive list of all the standards that are supported on Release 5 PXM1E and PXM45 based switches. To verify the support of a specific standard that is not listed in this appendix, please contact your Cisco account representative.

PNNI Compliance

The PXM45 and PXM1E based PNNI routing software was designed to be compliant with **1** below. The software supports robust topology convergence, dynamic and QoS based routing in hierarchical ATM networks with scalability from small to very large networks.

Other specifications to which the PNNI routing conforms are as follows:

1. ATM Forum, "PNNI Specification Version 1.0," af-pnni-0055.000, March 1996
2. ATM Forum, "PNNI V1.0 Errata and PICS," af-pnni-0081.000, March 1997
3. ATM Forum, "Interim Inter-switch Signaling Protocol (IISP) Specification Version 1.0," af-pnni-0026.000, December 1994
4. AINI
5. PNNI v2.0 draft
6. Path and Connection Trace

ATM Signaling Compliance

The following ATM Forum signaling specifications are supported:

- UNI 3.0/3.1 Signaling
- IISP Signaling
- PNNI Signaling
- ATM Signaling Interworking

Note ITU recommendations for B-ISDN DSS2 signaling is not currently supported.

UNI 3.0/3.1 Signaling

UNI 3.x signaling is supported.

Table D-1 UNI 3.x Signaling

Capability	Reference	Network Equipment Mandatory/Optional	Support
Point-to-Point calls	5.5	M	x
Address Registration	5.8	—	x
Sub-addressing	5.4.5.12, 14	—	x
B-LLI Negotiation	Annex C	M	x
AAL Parameter Negotiation	Annex F	M	x

UNI 4.0 Signaling

UNI 4.0 signaling is supported.

IISP Signaling

IISP 1.0 signaling is supported, including transport of SPVC IEs over an IISP trunk.

PNNI Signaling

PNNI signaling is supported.

Table D-2 PNNI Signaling

Capability	Reference	Network Equipment Mandatory//Optional	Support
Point-to-Point calls	6.5.2	M	x
Associated signaling	6.5.2.2.1	O	x
Non-associated signaling	6.5.2.2.2	O	x
ATM Parameter Negotiation	6.5.2.3.4	O	—
QoS Parameter Selection	6.5.2.3.5	O	x
ABR Signaling	6.5.2.3.6	O	x
Switched Virtual Path	6.5.2.2.2.2	O	x
Crankback	8. Annex B	M	x
Soft PVPC and PVCC	9. Annex C	O	x
SPVC Any VCCI value	9.2.3.1	O	
Generic Identifier Transport	6.4.5.31	O	x
Frame Discard	—	O	x

In addition to the above, the following PNNI 2.0 capabilities are supported on an interface.

Table D-3 PNNI 2.0 Interface Capabilities

Capability	Reference	Network Equipment Mandatory//Optional	Support
Connection Tracing	6.7	—	x
Path Tracing	6.7	—	x

ATM Signaling Interworking

Interworking between all combinations of signaling protocol is supported at all interfaces types: UNI to UNI, UNI to NNI and NNI to NNI.

Table D-4 ATM Signaling Interworking

Protocol	UNI 3.0	UNI 3.1	UNI 4.0	IISP 1.0	PNNI 1.0	AINI 3.0	AINI 3.1
UNI 3.0/3.1	x	x	x	x	x	x	x
UNI 4.0	x	x	x	x	x	x	x
IISP 1.0	x	x	x	x	x	x	x
PNNI 1.0	x	x	x	x	x	x	x
AINI 3.0	x	x	x	x	x	x	x
AINI 3.1	x	x	x	x	x	x	x

SONET/SDH

The standards and responsible organizations with which MGX switch SONET technology complies are as follows:

- Bell Communications Research–SONET Transport Systems: Common Generic Criteria, GR-253-CORE, Issue 2, 1995.
- ITU Recommendation G.782–Types and General Characteristics of Synchronous Digital Hierarchy (SDH) Equipment, January 1994.
- ITU Recommendation G.783–Characteristics of Synchronous Digital Hierarchy (SDH) Equipment Functional Blocks, January 1994.
- ITU Recommendation G.832–Transport of SDH Elements on PDH Networks: Frame and Multiplexing Structures, November 1993.
- ITU Recommendation G.958–Digital Line Systems based on the Synchronous Digital Hierarchy for use on Optical Fibre Cables, November 1994.

APPENDIX E

Hardware Survey and Software Configuration Worksheets

The worksheets in this chapter serve as a place to record the hardware installed in your switch and the configuration planning decisions you make as you plan your software configuration. Instructions for filling out the Hardware Survey worksheets appear in the "Verifying the Hardware Configuration" section of Chapter 2, "Configuring General Switch Features." The information you need to complete the software configuration worksheets appears in Chapter 1, "Preparing for Configuration" and in the *Cisco MGX 8850 (PXM1E/PXM45), Cisco MGX 8950, Cisco MGX 8830, and Cisco MGX 8880 Hardware Installation Guide, Releases 2 Through 5*.

Cisco recommends that you make copies of these tables and fill them out for each card on your switch as applicable. For example, if you have seven CESM cards on your Cisco MGX 8850 (PXM1E) switch, you should fill out the Cisco MGX 8850 (PXM1E/PXM45) hardware survey worksheet once and the CESM worksheet in Table E-8 seven times.

Once you have filled out the appropriate worksheets for your MGX switch, you can refer back to them to obtain information you need to complete configuration on your switch. You can also refer to these worksheets to troubleshoot and modify the configuration of your MGX switch in the future.

Note You only need to complete the worksheets that apply to your switch and the cards you installed on your switch.

Hardware Survey Worksheets

The hardware survey worksheets provide space for you to note the types of front and back cards installed in your switch and the redundancy relationships between them. The primary purpose of the survey worksheet is to document which cards are installed in the switch and give you a chance to validate that cards are installed in the correct locations and that back cards are compatible with front cards. The "Verifying the Hardware Configuration" section of Chapter 2, "Configuring General Switch Features," describes how to use the switch software to locate the information needed in the hardware survey worksheets.

Note The hardware survey worksheets do not contain all the information you need to configure the switch. Use the hardware survey worksheets to identify the hardware and validate the hardware installation. Use the software configuration worksheets in this chapter to plan the configuration for each card. You can validate the hardware first, or complete your configuration plan first. However, the configuration will not work correctly until the hardware installed matches the software configuration plan.

Table E-1, Table E-2, and Table E-3 serve as the hardware survey worksheets for the three types of Cisco MGX switches.

Table E-1 Cisco MGX 8830 Hardware Survey Worksheet

Slot	Reserved For	Front Card Type	Back Card	Redundant Slot	Redundancy Type
1	PXM1E			2	Primary
2	PXM1E			1	Secondary
3					
4					
5					
6					
7	SRM			14	Primary
8	PXM1E			—	—
9	PXM1E			—	—
10					
11					
12					
13					
14	SRM			7	Secondary

Table E-2 Cisco MGX 8850 (PXM1E/PXM45) Hardware Survey Worksheet

Slot	Reserved For	Front Card Type	Upper Back Card	Lower Back Card	Redundant Slot	Redundancy Type
1						
2						
3						
4						
5						
6						
7	PXM				8	Primary
8	PXM				7	Secondary
9						
10						
11						
12						
13						
14						
15	SRM				16	Primary
16	SRM				15	Secondary
17						
18						
19						
20						
21						
22						
23	PXM	—	—	—	—	—
24	PXM	—	—	—	—	—
25						
26						
27						
28						
29						
30						
31	SRM				32	Primary
32	SRM				31	Secondary

Table E-3 Cisco MGX 8950 Hardware Survey Worksheet

Slot	Reserved For	Front Card Type	Upper Back Card	Lower Back Card	Redundant Slot	Redundancy Type
1						
2						
3						
4						
5						
6						
7	PXM				8	Primary
8	PXM				7	Secondary
9	XM-60		—	—	—	—
10	XM-60		—	—	—	—
11						
12						
13						
14						
15						
16						
17						
18						
19						
20						
21						
22						
23	PXM	—	—	—	—	—
24	PXM	—	—	—	—	—
25	XM-60		—	—	—	—
26	XM-60		—	—	—	—
27						
28						
29						
30						
31						
32						

General MGX Switch Configuration Worksheet (PXM45, PXM1E, and SRM)

Table E-4 lists general switch parameters you can configure in each new switch.

Table E-4 General Switch Configuration Parameters

Feature	Parameter Information	Value to Configure
Switch name	Text	
IP Addresses		
Boot IP address information	Primary card address	
	Secondary card address	
	Network mask	
Disk or LAN IP address information	IP address	
	Network mask	
IP address information for access over ATM	IP address	
	Network mask	
SLIP IP address information	IP address	
	Network mask	
ATM Address and PNNI Configuration Data		
PNNI controller	Controller ID	2
	Controller type	2 (PNNI)
	Controller name	
PNNI level and lowest peer group ID	Refer to the *Cisco PNNI Network Planning Guide for MGX and SES Products*.	
PNNI node address	Refer to the *Cisco PNNI Network Planning Guide for MGX and SES Products*.	
SPVC prefix	Refer to the *Cisco PNNI Network Planning Guide for MGX and SES Products*.	
MPLS controller	Controller ID	3
	Controller type	3 (LSC)
	Controller name	
Administrator data		

Table E-4 General Switch Configuration Parameters (continued)

Feature	Parameter Information	Value to Configure
User *cisco*	Password	
User *service*	Password	
User *superuser*	Password	
Additional user	User name	
	Password	
	Access level	
Additional user	User name	
	Password	
	Access level	
Additional user	User name	
	Password	
	Access level	
Network Clock Source Plan		
Manual clock configuration	Primary clock source	
	Secondary clock source	
NCDP	Enabled or disabled?	
NCDP clock source	Port ID	
	Primary reference source	
	Clock type	
	Priority	
	Stratum level	
NCDP clock source	Port ID	
	Primary reference source	
	Clock type	
	Priority	
	Stratum level	
Network Management Plan		
SNMP access	Community	
	Contact	
	Location	
Software Version Data		
Boot software	Version number	
Runtime software	Version number	
Time Zone Data		

Table E-4 General Switch Configuration Parameters (continued)

Feature	Parameter Information	Value to Configure
Time zone	Enter a zone	
Time zone offset	Hours to offset	
PXM and SRM[1] Redundancy Options		
Standalone configuration	Primary or secondary card set installed?	
Upper bay SRM	SRM-3T3 or SRME?	
	Bulk distribution?	
Lower bay SRM	SRM-3T3 or SRME?	
	Bulk distribution?	
Redundant configuration		
Upper bay SRMs	SRM-3T3 or SRME?	
	Bulk distribution?	
	SRM line redundancy?	
Lower bay SRMs	SRM-3T3 or SRME?	
	Bulk distribution?	
	SRM line redundancy?	

1. SRM cards do not operate in Cisco MGX 8950 switches.

Additional PXM1E Information Configuration Worksheet

Table E-5 lists the additional information you will need to configure PXM1E cards.

Note PXM1E cards operate only on Cisco MGX 8850 (PXM1E) and Cisco MGX 8830 switches. If you are configuring a Cisco MGX 8850 (PXM45) or Cisco MGX 8950 switch, you do not need to fill out Table E-5.

Table E-5 Additional PXM1E Card Configuration Parameters

Feature	Parameter Information	Value to Configure
Card type	Front and back cards installed	
Standalone configuration	Using intracard APS?	
Redundant configuration	APS connector installed?	
Card SCT	SCT number	
Line operation mode	T1, E1, T3, or E3?	

Table E-5 Additional PXM1E Card Configuration Parameters (continued)

Feature	Parameter Information	Value to Configure
Line 1 Redundancy Options[1]		
Intracard APS	Working index[2]	*slot*.2.1
	Protection index[2]	*slot*.2.2
	Mode[3]	
Intercard APS	Working index[4]	*slot*.2.1
	Protection index[5]	*slot*.2.1
	Mode[6]	
Line 2 Redundancy Options[1]		
Intracard APS	Configured while configuring line 1	
Intercard APS	Working index[4]	*slot*.2.2
	Protection index[5]	*slot*.2.2
	Mode[6]	
Line 3 Redundancy Options[1]		
Intracard APS	Working index[2]	*slot*.2.3
	Protection index[2]	*slot*.2.4
	Mode[3]	
Intercard APS	Working index[4]	*slot*.2.3
	Protection index[5]	*slot*.2.3
	Mode[6]	
Line 4 Redundancy Options[1]		
Intracard APS	Configured while configuring line 3	
Intercard APS	Working index[4]	*slot*.2.4
	Protection index[5]	*slot*.2.4
	Mode[6]	
Line 5 Redundancy Options[1]		
Intracard APS	Working index[2]	*slot*.2.5
	Protection index[2]	*slot*.2.6
	Mode[3]	
Intercard APS	Working index[4]	*slot*.2.5
	Protection index[5]	*slot*.2.5
	Mode[6]	

Table E-5 Additional PXM1E Card Configuration Parameters (continued)

Feature	Parameter Information	Value to Configure
Line 6 Redundancy Options[1]		
Intracard APS	Configured while configuring line 5	
Intercard APS	Working index[4]	*slot*.2.6
	Protection index[5]	*slot*.2.6
	Mode[6]	
Line 7 Redundancy Options[1]		
Intracard APS	Working index[2]	*slot*.2.7
	Protection index[2]	*slot*.2.8
	Mode[3]	
Intercard APS	Working index[4]	*slot*.2.7
	Protection index[5]	*slot*.2.7
	Mode[6]	
Line 8 Redundancy Options[1]		
Intracard APS	Configured while configuring line 7	
Intercard APS	Working index[4]	*slot*.2.8
	Protection index[5]	*slot*.2.8
	Mode[6]	
Line 9 Redundancy Options[1]		
Intracard APS	Working index[2]	*slot*.2.9
	Protection index[2]	*slot*.2.10
	Mode[3]	
Intercard APS	Working index[4]	*slot*.2.9
	Protection index[5]	*slot*.2.9
	Mode[6]	
Line 10 Redundancy Options[1]		
Intracard APS	Configured while configuring line 9	
Intercard APS	Working index[4]	*slot*.2.10
	Protection index[5]	*slot*.2.10
	Mode[6]	

Table E-5 Additional PXM1E Card Configuration Parameters (continued)

Feature	Parameter Information	Value to Configure
Line 11 Redundancy Options[1]		
Intracard APS	Working index[2]	*slot*.2.11
	Protection index[2]	*slot*.2.12
	Mode[3]	
Intercard APS	Working index[4]	*slot*.2.11
	Protection index[5]	*slot*.2.11
	Mode[6]	
Line 12 Redundancy Options[1]		
Intracard APS	Configured while configuring line 11	
Intercard APS	Working index[4]	*slot*.2.12
	Protection index[5]	*slot*.2.12
	Mode[6]	

1. APS can only be configured on optical lines. For PXM1E-4-155, APS can be configured on lines 1 through 4, and on PXM1E-8-155, APS can be configured on lines 1 through 8. On PXM1E-COMBO, APS can be configured on lines 9 through 12.
2. Enter the slot number for the standalone PXM1E, which is 1 or 2 on Cisco MGX 8830 and 7 or 8 on Cisco MGX 8850 (PXM1E).
3. Valid options: 1+1, 1:1, annexB 1+1, or straight cable 1+1
4. Enter the slot number of the primary PXM1E, which is 1 on Cisco MGX 8830 and 7 on Cisco MGX 8850 (PXM1E).
5. Enter the slot number of the secondary PXM1E, which is 2 on Cisco MGX 8830 and 8 on Cisco MGX 8850 (PXM1E).
6. Valid options: 1+1, annexB 1+1, or straight cable 1+1

AUSM/B Configuration Worksheet

Table E-6 lists general switch parameters you will need to configure on each AUSM/B card.

Note AUSM/B cards operate only on Cisco MGX 8850 (PXM1E) and Cisco MGX 8830 switches. If you are configuring a Cisco MGX 8850 (PXM45) or Cisco MGX 8950 switch, or if you do not have AUSM/B cards installed in your switch, you do not need to complete the worksheet in Table E-6

Table E-6 General AUSM/B Configuration Parameters

Feature	Parameter Information	Value to Configure
Slot for this AUSM/B	Slot number	
Software Version Data		
Boot software	Version number	
Runtime software	Version number	
Card Redundancy Options		
Standalone configuration	Yes or no?	
1:N Redundant configuration		
Card role	Primary or secondary	
Card slot for other half of redundant card pair	Slot number	
Line distribution	Mode: back card or bulk distribution through an SRM	

AXSM Configuration Worksheet

Table E-7 lists general switch parameters you will need to configure on each AXSM card.

Note AXSM cards operate only on Cisco MGX 8850 (PXM45) and Cisco MGX 8950 switches, and on the Cisco MGX 8880 Media Gateway. The *Cisco MGX 8850 (PXM1E/PXM45), Cisco MGX 8950, Cisco MGX 8830, and Cisco MGX 8880 Hardware Installation Guide, Releases 2 Through 5* describes which AXSM cards operate in which switches. If you are configuring a Cisco MGX 8850 (PXM1E) or Cisco MGX 8830 switch, or if you do not have AXSM cards installed in your switch, you do not need to fill out Table E-7.

Table E-7 General AXSM, AXSM-E, and AXSM-XG Card Configuration Parameters

Feature	Parameter Information	Value to Configure
Slot for this AXSM	Slot number	
AXSM type	AXSM, AXSM/B, AXSM-E or AXSM-XG	
Software Version Data		
Boot software	Version number	
Runtime software	Version number	
Card Redundancy Options		
Standalone configuration	Yes or no?	
Redundant configuration		
Card role	Primary or secondary	
Card slot for other half of redundant card pair	Slot number	
APS connector installed?	Yes or no?	
Card SCT	SCT number	

CESM Configuration Worksheet

Table E-8 lists general switch parameters you will need to configure on each CESM card.

Note CESM cards do not operate in Cisco MGX 8950 switches. If you are configuring a Cisco MGX 8950 switch, or if you do not have CESM cards installed in your switch, you do not need to complete the worksheet in Table E-8.

Table E-8 General CESM Configuration Parameters

Feature	Parameter Information	Value to Configure
Slot for this CESM	Slot number	
Software Version Data		
Boot software	Version number	
Runtime software	Version number	
Card Redundancy Options		
Standalone configuration	Yes or no?	
1:N Redundant configuration		
Card role	Primary or secondary	
Card slot for other half of redundant card pair	Slot number	
Line distribution	Mode: back card or bulk distribution through an SRM	

FRSM-12-T3E3 Configuration Worksheet

Table E-9 lists general switch parameters you will need to configure on each FRSM-12-T3E3 card.

Note FRSM12 cards operate only on Cisco MGX 8850 (PXM45) switches. If you are configuring a Cisco MGX 8850 (PXM1E), Cisco MGX 8830, or Cisco MGX 8950 switch, or if you do not have FRSM12 cards installed in your switch, you do not need to complete the worksheet in Table E-9.

Table E-9 General FRSM12 Card Configuration Parameters

Feature	Parameter Information	Value to Configure
Slot for this FRSM-12-T3E3	Slot number	
Software Version Data		
Boot software	Version number	
Runtime software	Version number	
Card Redundancy Options		
Standalone configuration	Yes or no?	
1:1 Redundant configuration		
Card role	Primary or secondary	
Card slot for other half of redundant card pair	Slot number	
Card SCT	SCT number	

FRSM-2CT3, FRSM-2T3E3, and FRSM-HS2/B Configuration Worksheet

Table E-11 lists general switch parameters you will need to configure the FRSM-2CT3, FRSM-2T3E3, and FRSM-HS2/B cards.

Note If you are configuring a Cisco MGX 8950 switch, or if you do not have FRSM-2CT3, FRSM-2T3E3, and FRSM-HS2/B cards installed in your switch, you do not need to complete the worksheet in Table E-10.

Table E-10 General FRSM-2CT3, FRSM-2T3E3, and FRSM-HS2/B Configuration Parameters

Feature	Parameter Information	Value to Configure
Slot for this 8-port FRSM	Slot number	
Software Version Data		
Boot software	Version number	
Runtime software	Version number	
Card Redundancy Options		
Standalone configuration	Yes or no?	
1:1 Redundant configuration		
Card role	Primary or secondary	
Card slot for other half of redundant card pair	Slot number	

FRSM-8T1 and FRSM-8E1 Configuration Worksheet

Table E-11 lists general switch parameters you will need to configure channelized and non-channelized 8-port FRSM cards.

Note If you are configuring a Cisco MGX 8950 switch, or if you do not have 8-port FRSM cards installed in your switch, you do not need to complete the worksheet in Table E-11.

Table E-11 General FRSM-8T1 and FRSM-8E1 Configuration Parameters

Feature	Parameter Information	Value to Configure
Slot for this 8-port FRSM	Slot number	
Software Version Data		
Boot software	Version number	
Runtime software	Version number	
Card Redundancy Options		
Standalone configuration	Yes or no?	
1:N Redundant configuration		
Card role	Primary or secondary	
Card slot for other half of redundant card pair	Slot number	
Line distribution	Mode: back card or bulk distribution through an SRM	

MPSM-8-T1E1 Configuration Worksheet

Table E-12 lists general switch parameters you will need to configure channelized and non-channelized 8-port MPSM cards.

Note If you are configuring a Cisco MGX 8880 Media Gateway or a Cisco MGX 8950 switch, or if you do not have 8-port MPSM cards installed in your switch, you do not need to complete the worksheet in Table E-12.

Table E-12 General MPSM-8-T1E1 Configuration Parameters

Feature	Parameter Information	Value to Configure
Slot for this 8-port MPSM	Slot number	
Software Version Data		
Boot software	Version number	
Runtime software	Version number	
Interface type	T1 or E1	
Service type	Frame Relay, ATM, or Circuit emulation	
Card Redundancy Options		
Standalone configuration	Yes or no?	
1:N redundant configuration		
Card role	Primary or secondary	
Card slot for other half of redundant card pair	Slot number	
Line distribution	Mode: back card or bulk distribution through an SRM	

MPSM-T3E3-155 Configuration Worksheet

Table E-13 lists general switch parameters you will need to configure on each MPSM-T3E3-155 card.

Table E-13 General MPSM-T3E3-155 Card Configuration Parameters

Feature	Parameter Information	Value to Configure
Slot for this MPSM-T3E3-155	Slot number	
Software Version Data		
Boot software	Version number	
Runtime software	Version number	
Interface type	T3, E3, or OC-3	
Service type	Frame Relay, ATM, or Mulitservice	
Card Redundancy Options		
Standalone configuration	Yes or no?	
Redundant configuration		
Card role	Primary or secondary	
Card slot for other half of redundant card pair	Slot number	
APS connector installed?	Yes or no?	
Card SCT	SCT number	

VISM Configuration Worksheet

Table E-14 lists general switch parameters you will need to configure on each VISM card.

Note VISM cards do not operate in Cisco MGX 8950 switches. If you are configuring a Cisco MGX 8950 switch, or if you do not have VISM cards installed in your switch, you do not need to complete the worksheet in Table E-14.

Table E-14 General VISM Configuration Parameters

Feature	Parameter Information	Value to Configure
Slot for this VISM	Slot number	
Software Version Data		
Boot software	Version number	
Runtime software	Version number	
Card Redundancy Options		
Standalone configuration	Yes or no?	
1:N Redundant configuration		
Card role	Primary or secondary	
Card slot for other half of redundant card pair	Slot number	
Line distribution	Mode: back card or bulk distribution through an SRM	

VXSM Configuration Worksheet

Table E-15 lists general switch parameters you will need to configure on each VXSM card.

Note VXSM cards operate only on Cisco MGX 8850 (PXM45) and Cisco MGX 8950 switches. If you are configuring a Cisco MGX 8850 (PXM1E) or Cisco MGX 8830 switch, or if you do not have VXSM cards installed in your switch, you do not need to fill out Table E-7.

Table E-15 General VXSM Card Configuration Parameters

Feature	Parameter Information	Value to Configure
Slot for this VXSM	Slot number	
Software Version Data		
Boot software	Version number	
Runtime software	Version number	
Card Redundancy Options		
Standalone configuration	Yes or no?	
Redundant configuration		
Card role	Primary or secondary	
Card slot for other half of redundant card pair	Slot number	
APS connector installed?	Yes or no?	
Card SCT	SCT number	

APPENDIX F

MPSM Licensing

MPSM Licensing Information

The multiprotocol service module (MPSM) family of cards includes the MPSM-T3E3-155 and MPSM-8T1E1 service modules. With proper licensing, these cards can provide multiple services or features. The MPSM provides these services and features with the same hardware and same runtime firmware image using License Management. License Management is a software component that grants and enforces the use of licensed services. This appendix explains License Management functions and procedures.

This appendix is organized as follows:

MPSM License Overview

This appendix will help you with the following five MPSM licensing scenarios:

- You purchase MSPM cards and licenses as part of an initial chassis purchase. The license(s) will ship to you loaded on the PXM card.
- You purchase spare MPSM cards with licenses loaded.
- You purchase MPSM license(s) only, with no hardware.
- You need to transfer MPSM license(s) from one MGX node to another.
- You need to have MPSM licenses that are in an alarm state rekeyed.

Note You can purchase MGX systems, spares, and MPSM licenses from **www.cisco.com**, specifically, **http://www.cisco.com/order/apollo/configureHome.html**.

Tip Licensed services are new for MGX switches. Although available licenses are summarized in Table F-1, please read this whole appendix to become familiar with the terms and processes used for MPSM licensing. For example, if your shelf goes into Node License Alarm, you will have a 5-day grace period in which to recover licenses without interrupting service. After you read this whole appendix, you will be comfortable with the licensing and rekeying process. If you need additional assistance, please contact **licensing@cisco.com.**

Table F-1 lists the MPSM licenses that can be purchased for the MPSM8-T1E1 and MPSM-T3E3-155 cards.

Table F-1 Available Licensed Services for MPSM8-T1E1 and MPSM-T3E3-155 Cards

Name of Licensed Service	Product ID of Licensed Service for MPSM-8-T1E1 Card	Product ID of Licensed Service for MPSM-T3E3-155 Card	Description
Multiservice	—	MPSM-MS-HS-LIC(=)	The Multiservice License allows simultaneous provisioning of both ATM and Frame Relay connections on the MPSM-T3E3-155 module. One license of this type is required by a licensable service module.
RateControl	MPSM-RC-8-LIC (=)	MPSM-RC-HS-LIC(=)	**MPSM-8-T1E1:** The Rate Control license provides either Standard ABR or Foresight features to Frame Relay connections on the MPSM-8-T1E1 card. **MPSM-T3E3-155:** The Rate Control License allows the use of Standard ABR feature for Frame Relay connections. One Rate Control license is required by a licensable service module.
Channelization	—	MPSM-CH-HS-LIC(=)	Channelization License allows the physical port to support multiple DS0s for Frame Relay service and/or DS1s for ATM service. One license of this type is required by a licensable service module.
Multilink	—	MPSM-ML-HS-LIC(=)	This license covers multilink features, which includes IMA (Inverse Multiplexing for ATM). One license of this type is required by a licensable service module.

Licenses are installed on the PXM card and form a pool of licenses that is managed by the PXM controller. Licenses are authorized for a specific backplane serial number. (You cannot move licensed PXM cards to different chassis without sending the node into an alarm state.) The licenses can then be allocated to specific slots. When an MPSM card is provisioned, the licenses required for that configuration are allocated to that slot.

Note Redundant cards require the same licenses as the primary cards they protect. For 1:N redundancy, a redundant card needs one of each type of licence used by the primary cards it protects.

The PXM CLI command, **cnflic**, can be used to add licenses to the PXM license pool or to transfer licenses from other nodes. The **cnflic** command gets license information using the encrypted key that was generated by the License *Keycutter* application on a Cisco server when the license was purchased

The MPSM CLI command, **movlic**, moves licenses from the MPSM card to the PXM license pool.

Additional commands for managing licenses are **dsplicalms**, **dspliccd**, **dspliccds**, **dsplicnodeid**, and **dsplics**. These commands are described in procedures contained in this manual, and explained in greater detail in the *Cisco MGX 8850 (PXM45/PXM1E), Cisco MGX 8950, Cisco MGX 8830, and Cisco MGX 8880 Command Reference, Release 5*, at http://www.cisco.com/univercd/cc/td/doc/product/wanbu/8850px45/rel5/cmdref/index.htm.

MPSM licenses enable the optional MPSM features listed in Table F-2. These features are enabled whenever a feature license is available in the license pool.

Table F-2 Feature Options for MPSM Services

Licensed Feature	MPSM-8T1E1			MPSM-T3E3-155	
	ATM	Circuit Emulation	Frame Relay	ATM	Frame Relay
Rate Control	—	—	X	—	X
Channelization	—	—	—	X	X
Multiservice[1]	—	—	—	X	X
Multilink[2]	—	—	—	X	—

1. The multiservice feature allows ATM and Frame Relay services to run simultaneously only on MPSM-T3E3-155 cards.
2. The multilink feature enables IMA support for ATM services.

These licenses can be installed in the PXM *license pool*. In a shelf, there may be different MPSM cards that can support the licensed services and features. Licenses for one type of card cannot be used on another type of card. For the MPSM-T3E3-155 card, if no license is allocated to the service module, only the default single service functionality is available on that service module.

MPSM License Concepts and Terms

Table F-3 lists concepts and terms used to explain the MPSM licensing procedure.

Table F-3 MPSM License Concepts and Terms

Concept or Term	Description
Bulk License Activation file	File-based input to a CWM application to automate the process of license activation on multiple MGX nodes
Bulk License Registration file	File-based input to the license registration web page to facilitate registering multiple licenses on multiple nodes in one transaction
CLI	Command Line Interface
CWM	Cisco WAN Manager, Network Management Software for MGX nodes.
Digital License Agreement (DLA)	Corporate standard format for transporting license keys and associated metadata (PAK and/or RLK, License Agreement, related order information, transactional information)
License	A license allows the customer to use a certain service supported by the MPSM hardware, e.g., "IMA Service" license.
License Certificate	A claim certificate containing the PAK number and instructions for how a customer can register the license and obtain the RLK.
License Transfer	The process of transferring licenses from one MGX node to another. A similar concept is Re-Host.
MPSM License Keycutter	The Cisco-proprietary algorithm used to generate the MPSM RLK.
Node License ID	A required input field in the License Registration and License Transfer web pages. It's a combination of the Chassis Serial Number, Node License Sequence Number, and Runtime Firmware Version.
Node License Sequence Number	A unique number used to identify the license installation sequence on an MGX node. After a license or a set of licenses is installed on a node, this number is incremented.
Product Authorization Key (PAK)	A serial number that can either activate the software (and associated features) or be a required element to generate an RLK.
Registered License Key (RLK)	A key that requires specific element(s) in order to be generated, and it is subsequently used to enable the feature(s) supported by the license.
Rehost Authorization Key (RAK)	An encrypted key generated by the License Keycutter application to allow re-enabling (rekeying) of licenses on a node.
Software Licensing Engine (SLICE)	The system that will generate PAKs or RLKs based on product requirements.
Spare License	A license purchased independently from the hardware.
Transfer Authorization Key (TAK)	An encrypted key generated by the License Keycutter when the customer requests transferring licenses from one node to another. This key is then used on the source MGX node to initiate the transfer.

Table F-4 lists the terminology used for managing feature licenses on the MPSM cards.

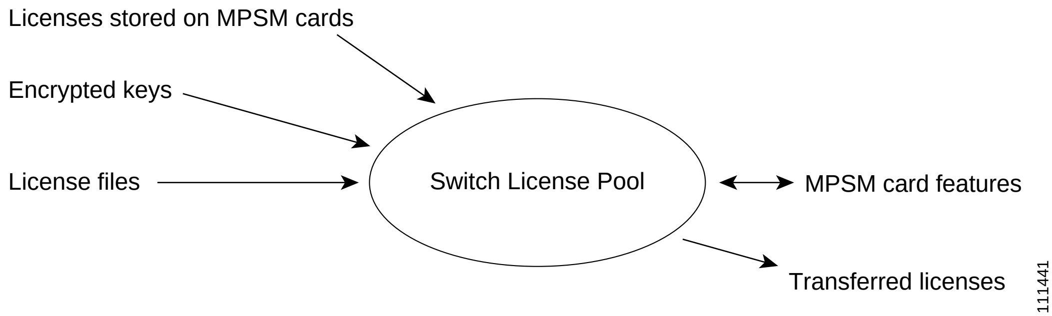
Table F-4 Feature LIcense Terminology for MPSM Cards

Term	Explanation
Allocated Licenses	To provide a feature or service, a license is acquired by a module from the pool of *installed* licenses on the node. An acquired license is referred to as *allocated* to the module.
Available Licenses	The *installed* licenses which are not *allocated* are said to be *available* in the license pool for use by modules.
Encrypted Key	A long string of characters generated by the Keycutter application. This string contains all information about purchased licenses as well as the node to which it can be applied.
Grace Period	Under certain conditions, if a sufficient number of licenses are not available or if licenses are invalid, the system is allowed for certain period of time to run without impacting service. This period is called the *Grace Period,* and by default it is set to 5 days (120 hours). **Note** Within this period, it is responsibility of the system owner to purchase and install the required number of licenses to avoid service degradation after this period has expired.
Installed Licenses	This refers to the purchased licenses which have been added to the license pool owned by the node. The *installed* licenses in the license pool can be used by the service modules plugged into the MGX node. Licenses are used by the modules on as-needed basis.
License Pool	*License Pool* is a persistent database of all installed licenses owned by an MGX node. Service modules are *allocated* licenses from this pool to provide services and features. Licenses are added to the pool by *installing* them on the node using **cnflic** or **movelic** CLI commands.
Moving Licenses	When *programmed* licenses migrate from a module NVRAM into the license pool and become *installed*, we refer the process as *moving* the licenses from a card to the license pool.
Needed Licenses	These are licenses that are required by an entity (such as a service module) to provide desired services or features. For the entity to operate normally, it must have same number of *allocated* licenses as *needed* licenses.
Programmed Licenses	When the licenses are supplied in the NVRAM of a module, we refer to them as physically *programmed* licenses. These licenses cannot be *allocated* to any module, but they can be *installed* in a node by *moving* them from NVRAM of the module to the license pool owned by the MGX node.
Registering Licenses	When licenses are *moved* from the card's NVRAM to the license pool, the process is also referred to as *registering* licenses with the node.
Rekey License	If a licensed shelf database is migrated to another non-native shelf, the licenses become invalid. To revalidate shelf licenses, *Rekeying* or *Rehosting* licenses is necessary. The special license that achieves this purpose is the *Rekey* License. *Rekey* license is the same as RAK.
Transferring Licenses	You can migrate *installed* licenses from one node's license pool to another node's *installed* pool of licenses. This process is referred to as *transferring* licenses.

PXM License Pool

Figure F-1 illustrates the license pool and the types of items that are stored in it.

Figure F-1 The Switch License Pool



The switch license pool serves as a depository for all licenses installed on a switch. When a card needs to use a license, it checks the license out of the depository and the license becomes unavailable to all other cards while it is checked out. For example, if a standard ABR connection is provisioned on an MPSM-8T1E1 card configured for Frame Relay services, a rate control license in the pool is checked out or allocated to that card. If the ABR connection is removed and no other ports on the card have provisioned standard ABR connections, the rate control feature license is checked back into the license pool and becomes available for other cards.

There are three ways to add licenses to the license pool:

- If the license is purchased with the MPSM card, use **movlic** to move the license(s) from the MPSM card to the PXM license pool.
- If the license is purchased alone—without the MPSM hardware, use **cnflic** to add the license(s) to the PXM license pool.
- If you want to move a license from one MGX node to another MGX node, you must *transfer* the license.

To explain these cases further, if a license is purchased at the same time as the MPSM card, the license can be programmed on the MPSM card. When a license is programmed on an MPSM card, the license is unavailable to that card and all other cards in the switch. To enable use of the license, it must be moved to the switch license pool, which is a database on the PXM card. The MPSM **movelic** CLI command is used to move programmed licenses from MPSM cards to the PXM license pool.

If you want to add licenses after receiving an MPSM card, you can purchase them using the Cisco.com website. Licenses that are purchased on the web site can arrive in the form of an encrypted key in an E-mail message or a file that contains an encrypted key. The PXM **cnflic** command is used with the encrypted key or license file to add licenses to the PXM license pool.

When a license is checked out, the switch records the assignment of the feature to a card and enables the feature on the card. The license remains in the license pool until explicitly removed. The only way to safely remove a license from the pool is to explicitly transfer it to another switch.

Displaying License Data

Display commands allow you to view node license data, card license data, or license history data. The following sections describe ways to view the license data.

Displaying All Node Licenses

To display all node licenses, enter the **dsplics** command as follows:

```
M8830_CH.1.PXM.a > dsplics

M8830_CH                         System Rev: 04.09   Mar. 08, 2004 00:15:51 GMT
MGX8830                                              Node Alarm: CRITICAL
Licensed           License      Licenses   Licenses   Licenses
Card Type          Type         Installed  Allocated  Available
-----------------  -----------  ---------  ---------  ---------
MPSM-T3E3-155      MultiSrvc    4          1          3
                   Channelize   4          1          3
                   Multilink    4          0          4
                   RateControl  4          1          3
```

This command displays all the license data on the node for all MPSM card types. It also shows how many licenses are in use and how many are available.

Displaying Licenses for a Specific MPSM Card Type

To display the license usage for a specific MPSM card type, enter the **dsplics -cd** command as follows:

```
M8830_CH.1.PXM.a > dsplics -cd 3

M8830_CH                         System Rev: 04.09   Mar. 08, 2004 00:08:45 GMT
MGX8830                                              Node Alarm: CRITICAL
Licensed           License      Licenses   Licenses   Licenses
Card Type          Type         Installed  Allocated  Available
-----------------  -----------  ---------  ---------  ---------
MPSM-T3E3-155      MultiSrvc    4          1          3
                   Channelize   4          1          3
                   Multilink    4          0          4
                   RateControl  4          1          3
```

The number in the command specifies the MPSM card type which must be one of the following:

- MPSM-8-T1E1 = 1
- MPSM-T3E3-155 = 3

The **dsplics -cd** command displays the same information as the **dsplics**, command, but it limits the display to a single card type.

Displaying the License Usage for All Cards

To display the license usage for all cards in a switch, enter the **dspliccds** command as follows:

```
M8830_CH.1.PXM.a > dspliccds

M8830_CH                         System Rev: 05.00   Apr. 11, 2004 19:08:26 GMT
MGX8830                                              Node Alarm: CRITICAL
                         Card Lic  Prov     License      Allocated
Slot  Card Type          Alarm     Allowed  Type         Licenses
----  -----------------  --------  -------  -----------  ---------
```

```
3     --                 --        --       --           0
4     --                 --        --       --           0
5     --                 --        --       --           0
6     --                 --        --       --           0
7     --                 --        --       --           0
8     --                 --        --       --           0
9     --                 --        --       --           0
10    --                 --        --       --           0
11    --                 --        --       --           0
12    MPSM-T3E3-155      No        Yes      Channelize   1
13    --                 --        --       --           0
14    --                 --        --       --           0
```

Note Redundant cards require the same licenses as the primary cards they protect. For 1:N redundancy, a redundant card needs one of each type of licence used by the primary cards it protects.

Displaying Licenses for All Cards

The **dspliccds** command displays the total licenses allocated or programmed on all cards. The **dspliccds** command is a non-privileged command and is available on the PXM45 and PXM1E cards.

Note To get detailed information for a specific card, use **dspliccd** command for a particular slot.

The following example displays licenses of all cards.

```
MGX8850.7.PXM.a>dspliccds
Mynode19                         System Rev: 04.00   Feb. 27, 2003 17:28:26 GMT
Chassis Serial No:   SAA02390010 Chassis Rev: E4     GMT Offset: 0
                                                     Node Alarm: MAJOR

      Card            Card Lic    Prov    License       Alloc
Slot  Type            Alarm       Status  Type          lics
----  -------------   --------    ------  -------       ----
 1    --              --          --      --            --
 2    --              --          --      --            --
 3    MPSM-T3E3-155   No          Yes     MultiSrvc     1
                                          Channelize    1
                                          MultiLink     1
                                          RateControl   1
 4    MPSM-T3E3-155   Minor       Yes     MultiSrvc     1
 5    MPSM-T3E3-155   Minor       No      MultiSrvc     1
                                          MultiLink     1
 6    MPSM-T3E3-155   No          Yes     --            --
 9    --              --          --      --            --
 10   MPSM-8T1E1      No          Yes     RateControl   1
 11   MPSM-8T1E1      No          Yes     --            --
 12   MPSM-8T1E1      No          Yes     RateControl   1
 12   MPSM-16T1E1     No          Yes     MultiSrvc     1
                                          MultiLink     1
                                          RateControl   1
                                          PPP           1
 ...
 ...
```

The following example displays *programmed* licenses of all cards.

```
MGX8850.7.PXM.a> dspliccds -prog
Mynode19                         System Rev: 04.00   Feb. 27, 2003 17:28:26 GMT
Chassis Serial No:   SAA02390010 Chassis Rev: E4     GMT Offset: 0
```

```
                                                        Node Alarm: MAJOR

      Card             Licenses    License        Programmed
Slot  Type             Moved       Type           lics
----  -------------    --------    -------        ----------
 1    --               --          --             --
 2    --               --          --             --
 3    MPSM-T3E3-155    No          MultiSrvc      1
                                   Channelize     1
                                   MultiLink      1
 4    MPSM-T3E3-155    Yes         MultiSrvc      1
                                   Channelize     1
 5    MPSM-T3E3-155    Yes         MultiSrvc      1
                                   MultiLink      1
                                   RateControl    1
 6    MPSM-T3E3-155    N/A         --             --
 9    --               --          --             --
 10   MPSM-8T1E1       No          RateControl    1
 11   MPSM-8T1E1       N/A         --             0
 12   MPSM-8T1E1       Yes         RateControl    1
 13   MPSM-16T1E1      N/A         --             0
 ...
 ...
 ...
```

Displaying the License Usage for a Specific Card

To display the license usage for a single card within a switch, enter the **dspliccd** command on either the PXM or the MPSM. The following example shows how the display appears when the command is run from a PXM card:

```
M8830_CH.11.PXM.a > dspliccd  11

M8830_CH                         System Rev: 04.00   Feb. 27, 2003 17:28:26 GMT
Chassis Serial No:   SAA02390010 Chassis Rev: E4     GMT Offset: 0
                                                     Node Alarm: NONE
Card License Alarm:           Minor
Service Module Type:          MPSM-T3E3-155
Service Module Serial Number: 3SA4567011
Provisioning allowed:         Yes
Grace-Period Remaining:       3 Days 4 Hours
=========================================================
Allocated License Type        Qty
----------------------        ----
Multi-Srvc                    1
Channelize                    1
=========================================================
Programmed License Type       Qty
-----------------------       ----
Multi-Srvc                    1
Channelize                    1
=========================================================
Programmed Licenses Registered:           YES
License Registration Node:                MyNodeBuilding3
License Registration Chassis Serial No:   8SA931247821
License Creation Timestamp:               Oct 25, 2003 14:20:40
License Registration Timestamp:           Dec 02, 2003 19:33:12
=========================================================
```

In the example above, the following states might occur:

- If the *grace period* has already expired, the following output displays:

```
Provisioning allowed:        No
Grace-Period Status:          Expired
```

- If the slot is running normally without a license alarm, only the following output displays:

```
Provisioning allowed:         Yes
```

The number after the **dspliccd** command is the slot number for which you want to display license data.

An *allocated* license is one that has been assigned to a card. A *programmed* license is a license that has been shipped on a card from the factory. It must be moved to the license pool before it can be allocated to a card.

In the next example, the **dspliccd** command is run from an MPSM card, so you do not have to enter the slot number:

```
M8830_CH.12.MPSM155[FR].a > dspliccd
Card License Alarm:               None
Service Module Type:              MPSM-T3E3-155
Service Module Serial Number:     SAD073504CT
Provisioning (addcon) Allowed:    YES
=========================================================
Needed License Type                Needed Licenses
-------------------                ---------------
Multi-Srvc                         1
Channelize                         1

=========================================================
Allocated License Type             Allocated licenses
----------------------             ------------------
Multi-Srvc                         1
Channelize                         1

=========================================================
Programmed  License Type           Programmed licenses
------------------------           -------------------
Multi-Srvc                         1
Channelize                         1

=========================================================
Programmed License Registered:    YES
License registration node:        M8830_CH
License registration chassis:     8SA931247821
=========================================================
```

In the example above, a *needed* license is a license that is required by the MPSM card to provide a desired feature.

Displaying a History of License Updates

To display a history of all license updates on the switch, enter the **dsplics -history** command as follows:

```
M8830_CH.1.PXM.a > dsplics -history
M8830_CH                          System Rev: 04.09   Mar. 08, 2004 00:20:22 GMT
MGX8830                                               Node Alarm: CRITICAL
Licensed            Chassis or     Update    Update     License
CardType            Card Serial#   Method    Sequence#  Update Time
----------------    ------------   --------  ---------  -----------
MPSM-T3E3-155       SAG06152SZM    Addition  1          WED OCT 08 19:58:54 2003
```

Displaying License Alarms

To display a list of license feature alarms, enter the **dsplicalms** command as follows:

```
M8830_CH.1.PXM.a > dsplicalms
M8830_CH                        System Rev: 04.09   Mar. 08, 2004 00:20:59 GMT
MGX8830                                             Node Alarm: CRITICAL
Slot  Critical   Major     Minor   ||  Slot  Critical   Major     Minor
----  --------  -------   -------  ||  ----  --------  -------   -------
 1          0        0         0   ||   8          0        0         0
 2          0        0         0   ||   9          0        0         0
 3          0        0         0   ||  10          0        0         0
 4          0        0         0   ||  11          0        0         0
 5          0        0         0   ||  12          0        0         0
 6          0        0         0   ||  13          0        0         0
 7          0        0         0   ||  14          0        0         0
```

Adding Licenses Purchased from Cisco.com

Purchased licenses are delivered in the form of an encrypted key, which appear within an E-mail message or within a text file attached to an E-mail. When ordering additional licenses, you must provide the back plane serial number for the switch that will host the licenses. The output generated by the **dsplicnodeid** command is part of the encryption key.

The general procedure is as follows:

1. Purchase additional licenses from Cisco.com and receive a Product Authorization Key (PAK) by mail.
2. Collect the serial number used for licensing from the destination switch.
3. Using Cisco.com, the PAK, and the destination switch serial number, generate a license key for the destination switch.
4. Move the new license key to the destination switch.
5. Apply the new license on the destination switch.

The following procedure describes how to obtain the back plane serial number so that you can purchase licenses, and it describes how to install licenses when you receive them.

Step 1 Establish a configuration session using a user name with SERVICE_GP privileges or higher.

Step 2 Purchase additional licenses from Cisco.com. After you purchase additional licenses, a Product Authorization Key (PAK) will be mailed to you.

Step 3 To display the switch serial number used for licensing, enter the **dsplicnodeid** command. If no licenses have been installed, the switch will generate a node license ID as shown in the following example:

```
M8850_SF.7.PXM.a > dsplicnodeid

The BkPL recorded Lic Seq Num did not exist. Creating with 0.

NodeID=SCA062300GF:000000:004:009:015
```

If the switch has an existing node license ID, it is displayed as follows:

```
M8850_SF.7.PXM.a > dsplicnodeid

NodeID=SCA062300GF:000001:004:009:015
```

Step 4 To generate a license key on Cisco.com, go to the web page specified in the "MPSM License Overview" section on page F-1.

At this web page, you must specify the PAK and the licenses you want to install, and you must specify the serial number collected in Step 2. After you arrange for additional licenses, you will receive an encrypted key in an E-mail message and in a license file attachment. The key contains the new license information for the destination switch.

- If you plan to install the new license on the destination switch using the new license file, go to Step 6.
- If you plan to install the licenses using the encrypted key sent in the E-mail message, go to Step 5.

Step 5 To install a license using a license file, FTP that file to the C:/LICENSE directory on the destination switch. Enter the **cnflic** command using the following syntax:

```
M8850_SF.7.PXM.a > cnflic -f filename
```

Replace *filename* with the name of the file provided by Cisco.com as shown in the following example:

```
M8850_SF.7.PXM.a > cnflic -f Lmpsmoc3_20040615113118099.dat
Update method : Addition
Card type : MPSM-T3E3-155
Creation date/time : TUE JUN 15 10:31:18 2004
Grace period (days) : 0
Update sequence number: 6
Licence serial number : L0000003878
Num of features : 4
--------------- -----
License Type Qty
--------------- -----
MultiSrvc 1
Channelize 1
RateControl 1
MultiLink 1

Please confirm the above licence information.
cnflic: Do you want to proceed (Yes/No)? y

M8850_SF.7.PXM.a >
```

Note Skip to Step 7.

Step 6 To install a license using an encrypted license key, copy the license key from the E-mail and enter the **cnflic** command using the following syntax:

```
M8850_SF.7.PXM.a > cnflic licenseString
```

Replace *licenseString* with the encrypted key supplied in the E-mail message as shown in the following example:

```
M8850_SF.7.PXM.a > cnflic
01050004cbf7420c534f5e21b97754bdb81da8862607040eebc5702aa37cc1e1c5d4e9b00ea6c89c13f1e50df0
2dc8b374f42e84bf96fd1af672fe571a98ae1bf411d3b4dbd
Update method : Addition
Card type : MPSM-T3E3-155
Creation date/time : TUE JUN 15 10:17:39 2004
Grace period (days) : 0
Update sequence number: 5
Licence serial number : L0000008633
Num of features : 4
--------------- -----
License Type Qty
```

```
--------------- -----
MultiSrvc 1
Channelize 1
RateControl 1
MultiLink 1

Please confirm the above licence information.
cnflic: Do you want to proceed (Yes/No)? y

M8850_SF.7.PXM.a >
```

Step 7 To verify that new licenses have been installed, enter the **dsplics** command.

Caution To avoid losing licenses during a configuration restoration, save the switch configuration after installing the new licenses by using the **saveallcnf** command.

Step 8 Enter the **saveallcnf** command.

Moving Licenses from an MPSM Card to the Switch

To move programmed licenses from an MPSM card to the switch license pool, use the **cc** command to move to the CLI prompt for the MPSM card. Then enter the **movelic** command as follows:

```
M8250_SJ.1.22.MPSM8T1.FRM.a > movelic
------------------------------------------------
Programmed License Type #Programmed
----------------------- -----------
Rate-Control 1

Do you want to proceed (Yes/No)? Yes

Card Licenses have been moved to license pool.

M8250_SJ.1.22.MPSM8T1.FRM.a >
```

Note The **movelic** command requires SERVICE_GP privileges.

In the above example, the **movelic** command moved all licenses programmed into the NVRAM on the MPSM card into the PXM license pool. Licenses can be moved only once from a card to a license pool. Licenses cannot be moved back to an MPSM card. If you want to transfer licenses to another switch, see “Transferring Licenses Between Switches.”

Caution To avoid losing licenses during a configuration restoration, save the switch configuration after moving the new licenses into the PXM license pool by using the **saveallcnf** command.

Allocating Feature Licenses to a Card

To allocate a feature license to an MPSM card, configure the card to use the licensed feature. For example, to allocate the IMA feature to a card, use the **addimagrp** command to create an IMA group. Licenses are also allocated to redundant cards, so if you use the **addred** command to configure a

secondary card for a primary card, licenses are allocated to the secondary card. When the secondary card serves multiple primary cards, the secondary card receives one of each type of license used by the primary cards it serves.

If the license pool on the switch has an available license for that feature on the MPSM card type, the license is automatically allocated to the card. Once a license is allocated to the card, it is no longer available for use on other cards until it returns to the license pool (See “Recovering Feature Licenses That are Not In Use”).

If you configure a card to use a feature for which no licenses are available, the command that requires the feature will fail.

Recovering Feature Licenses That are Not In Use

Feature licenses are automatically returned to the license pool when the card configuration no longer requires them. The following actions can be used to remove the configuration for featured licenses:

- Use the CLI commands to remove the feature configuration. For example, if you delete all channelized ports (**delport**) on a card, the channelized feature is no longer required and will be returned to the license pool.
- Clear the entire configuration on the service module (**clrsmcnf**).
- Clear the entire configuration on the switch (**clrallcnf**).
- Delete a redundant card configuration. This action releases any licenses reserved for the secondary card, provided that those licenses are no longer required for other primary cards.

When licenses are returned to the license pool, they are immediately available for use on other MPSM cards.

Saving and Restoring the License Configuration

MPSM feature licenses are backed up and restored with the complete switch configuration as described in the “Managing the Configuration Files” section in Chapter 9, “Switch Operating Procedures”.

Caution To avoid losing feature licenses, always save the switch configuration after you move, transfer, or add licenses, by using the **saveallcnf** command.

Transferring Licenses Between Switches

When you transfer licenses between switches, you are removing one or more licenses from one switch for use on another switch. To transfer licenses between switches, you will need to get a transfer license from Cisco.com. The general procedure is as follows:

1. Collect the switch serial numbers used for licensing from the source and destination nodes.
2. Using Cisco.com, enter the output generated by the **dsplicnodeid** command, specify the licenses to transfer, and obtain a transfer license.
3. Move the transfer license to the source switch.
4. Apply the transfer license on the source switch to remove the desired licenses and obtain a new license key and file that can be applied on the destination switch.

5. Transfer the new license to the destination switch.
6. Apply the new license on the destination switch.

The following procedure provides instructions for transferring licenses between switches.

Step 1 Establish a configuration session with the source and destination switches using a user name with SERVICE_GP privileges or higher.

Step 2 To display the switch serial number used for licensing on the source switch, enter the **dsplicnodeid** command.

```
M8850_SF.7.PXM.a > dsplicnodeid

NodeID=SCA062300GF:000001:004:009:015
```

Step 3 To display the switch serial number used for licensing on the destination switch, enter the **dsplicnodeid** command.

```
M8850_SF.7.PXM.a > dsplicnodeid

NodeID=SCA062300GF:000001:004:009:020
```

Step 4 To request a transfer license from Cisco.com, go to the URL specified in the URL in the "MPSM License Overview" section on page F-1.

At the license transfer web page, specify the serial numbers you collected in Step 2 and Step 3, and specify the licenses to transfer. After you arrange for a transfer license, you will receive an encrypted key in an E-mail message and in a license file. The encrypted key contains the license transfer information for the specified source and destination switches. Before you can apply the transfer license at the source switch, you must either copy the key from the E-mail message to the switch, or copy the file to the switch.

- If you plan to install licenses using the encrypted key in the E-mail message, go to Step 5.
- If you plan to apply the transfer license using the transfer license file, go to Step 6.

Step 5 To apply the transfer license using the key in the E-mail from Cisco.com, copy the key from the E-mail, and enter the **cnflic** command on the source switch, using the following syntax:

```
M8850_SF.7.PXM.a > cnflic licenseString
```

Replace *licenseString* with the encrypted key supplied in the E-mail message as shown in the following example:

```
M8850_SF.7.PXM.a > cnflic
01050004fec28e9e8ab1110f48be83e0d2397cb4048d7c368c53c825c15e9245d5886357eac618012a8b515d1c
3fa29a8f35476b28331ca12b1bef166dc7c0bafc01d9e0b36
Update method : Xfer-out
Card type : MPSM-T3E3-155
Creation date/time : TUE JUN 15 10:40:55 2004
Grace period (days) : 0
Update sequence number: 7
Licence serial number : L0000003912
Num of features : 4
--------------- -----
License Type Qty
--------------- -----
MultiSrvc 1
Channelize 1
RateControl 1
MultiLink 1

Please confirm the above licence information.
```

```
cnflic: Do you want to proceed (Yes/No)? y
Licence file has been generated as: C:/LICENSE/LX-M8850_NY-7.lic
Licence is:
0105000443e166180e7a310f483833a54079b77eb217332057c3d2fbaa4e9245def5aad5558458d6ab2f6bc64a
6c0441839dbdbb43e02aa7a179facb8e058de821e270a233ce87c3

M8850_SF.7.PXM.a >
```

This step removes the licenses identified for transfer from the license pool, and these licenses are no longer available for use on the source switch. To verify that transferred licenses have been removed from the source switch, enter the **dsplics** command.

This step also generates a new license key and a new license file, which can be used to install the removed licenses on the destination switch. The license key appears in the command output. The license file is stored in the C:/LICENSE directory.

Note Go to Step 7.

Step 6 To apply the transfer license using the key in the license file attached to the E-mail from Cisco.com, FTP that file to the C:/LICENSE directory on the switch, and enter the **cnflic** command on the source switch, using the following syntax:

```
M8850_SF.7.PXM.a > cnflic -f filename
```

Replace *filename* with the name of the license file provided by Cisco.com as shown in the following example:

```
M8850_SF.7.PXM.a > cnflic -f Lmpsmoc3_20040615114539410.dat
Update method : Xfer-out
Card type : MPSM-T3E3-155
Creation date/time : TUE JUN 15 10:45:39 2004
Grace period (days) : 0
Update sequence number: 8
Licence serial number : L0000008916
Num of features : 4
--------------- -----
License Type Qty
--------------- -----
MultiSrvc 1
Channelize 1
RateControl 1
MultiLink 1

Please confirm the above licence information.
cnflic: Do you want to proceed (Yes/No)? y
Licence file has been generated as: C:/LICENSE/LX-M8850_NY-8.lic
Licence is:
0105000451ee9dc73e426022d432745064f747169cd393f4a8c5238cfe5ac0166765c9ea6428276a01df3225df
ac9aadf17951b2972bb2acf0950fda2a57892fe6e3ec93e1a26e16

M8850_SF.7.PXM.a >
```

This step removes the licenses identified for transfer from the license pool, and these licenses are no longer available for use on the source switch. To verify that transferred licenses have been removed from the source switch, enter the **dsplics** command.

This step also generates a new license key and a new license file, which can be used to install the removed licenses on the destination switch. The license key appears in the command output. The license file is stored in the C:/LICENSE directory.

Note To install the new license(s) using the encrypted key produced in Step 5 or Step 6, go to Step 7

To install the new license(s) on the destination switch using the new license file produced in Step 5 or Step 6, go to Step 8.

Step 7 To install the new license(s) on the destination switch using the key displayed on the source switch, copy the key and enter the **cnflic** command with the key generated from the source switch:

```
M8850_SF.7.PXM.a > cnflic
0105000443e166180e7a310f483833a54079b77eb217332057c3d2fbaa4e9245def5aad5558458d6ab2f6bc64a
6c0441839dbdbb43e02aa7a179facb8e058de8213
Update method : Xfer-in
Card type : MPSM-T3E3-155
Creation date/time : TUE JUN 15 18:40:55 2004
Grace period (days) : 0
Update sequence number: 4
Licence serial number : L0000003912
Num of features : 4
--------------- -----
License Type Qty
--------------- -----
MultiSrvc 1
Channelize 1
RateControl 1
MultiLink 1

Please confirm the above licence information.
cnflic: Do you want to proceed (Yes/No)? y

M8850_SF.7.PXM.a >
```

Note Skip to Step 9.

Step 8 To install the new license on the destination switch using the key in the new license file generated from the source switch, FTP that file to the C:/LICENSE directory on the destination switch enter the **cnflic** command using the following syntax:

```
M8850_SF.7.PXM.a > cnflic -f filename
```

Replace *filename* with the name of the file transferred from the source switch as shown in the following example:

```
M8850_SF.7.PXM.a > cnflic -f LX-M8850_NY-8.lic
Update method : Xfer-in
Card type : MPSM-T3E3-155
Creation date/time : TUE JUN 15 18:45:39 2004
Grace period (days) : 0
Update sequence number: 5
Licence serial number : L0000008916
Num of features : 4
--------------- -----
License Type Qty
--------------- -----
MultiSrvc 1
Channelize 1
RateControl 1
MultiLink 1

Please confirm the above licence information.
```

```
cnflic: Do you want to proceed (Yes/No)? y

M8850_SF.7.PXM.a >
```

Step 9 To verify that the transferred licenses have been installed on the destination switch, enter the **dsplics** command.

Step 10 Enter the **saveallcnf** command.

Caution To avoid losing licenses during a configuration restoration, save the switch configuration at the source and destination switches by using the **saveallcnf** command.

MPSM License Alarms

MPSM feature license alarms can occur at the node level or the slot level of the switch. The following sections describe these alarms:

- Node License Alarm
- Slot License Alarms

Node License Alarm

Node license alarms occur under the following conditions:

- A switch configuration that was saved before licenses were added or transferred to and from the PXM license pool has been restored. Any mismatch between the actual license count and the restored license count generates a minor license alarm. To prevent this type of alarm, always save the switch configuration (**saveallcnf)** after you move, transfer, or add licenses.
- The switch configuration is restored on a different node, or the Cisco MGX chassis is replaced with another chassis. Because licenses are authorized for a specific backplane serial number, such conditions will cause a mismatch between the physical backplane serial number and serial number recorded in the database.

When a node license alarm is raised, all cards that are using feature licenses go into the slot license alarm state. If no licenses are in use by the cards, no slot license alarms will be raised.

On PXM45 and PXM1E platforms, use the PXM **dspndalms** command to troubleshoot the node license alarm. As shown in the following example on the PXM45 platform, the output of this command will indicate if the switch is in the node license alarm state:

```
M8850_SF.8.PXM.a > dspndalms
Node Alarm Summary

Alarm Type                    Critical       Major          Minor
----------                    --------      -------        -------
Clock Alarms                        0            0              0
Switching Alarms                    0            0              0
Environment Alarms                  0            0              0
Card Alarms                         0            0              0
Node License Alarm                  0            0              1

M8850_SF.8.PXM.a >
```

Node license alarms are cleared by validating licenses in the license pool. This is done by applying the special Rekey feature license to the node using the **cnflic** command. When the pool licenses are validated, any existing slot license alarms are also cleared and normal operation is restored. For the procedure to rekey feature licenses, see "Rekeying Feature Licenses".

Note If the switch is in node license alarm, you must rekey the PXM license pool *before* proceeding with any other license management tasks.

Slot License Alarms

Slot license alarms are raised under the following conditions:

- When a node license alarm is raised, all cards that are using feature licenses go into the slot license alarm state. Slot license alarms raised under this condition can be cleared by rekeying the PXM license pool. For the procedure to rekey feature licenses, see "Rekeying Feature Licenses".
- The slot in alarm has acquired or oversubscribed one or more licenses while these licenses were not available in the license pool. Slot license alarms raised under this condition are cleared by adding the required number of licenses to the PXM license pool or by releasing corresponding licenses from other slots so that they become available to the slot in alarm. If slots in alarm have redundancy, you must add licenses to cover both the primary and secondary slots to clear the alarms.

On PXM1E and PXM45 platforms, use the PXM **dsplicalms** command to troubleshoot slot license alarms. The output of this command will indicate which MPSM cards are in the slot license alarm state. The following example shows the output of the PXM **dsplicalms** command on the PXM45 platform. In this example, the MPSM card in slot 28 is in slot license alarm:

```
M8850_SF.8.PXM.a > dsplicalms
M8850_SF                         System Rev: 05.00   Jul. 10, 2004 04:35:12 GMT
MGX8850                                              Node Alarm: MINOR
Slot  Critical   Major     Minor    ||  Slot  Critical   Major     Minor
----  --------  -------   -------   ||  ----  --------  -------   -------
 1          0        0          0   ||  17          0        0          0
 2          0        0          0   ||  18          0        0          0
 3          0        0          0   ||  19          0        0          0
 4          0        0          0   ||  20          0        0          0
 5          0        0          0   ||  21          0        0          0
 6          0        0          0   ||  22          0        0          0
 7          0        0          0   ||  23          0        0          0
 8          0        0          0   ||  24          0        0          0
 9          0        0          0   ||  25          0        0          0
10          0        0          0   ||  26          0        0          0
11          0        0          0   ||  27          0        0          0
12          0        0          0   ||  28          0        0          1
13          0        0          0   ||  29          0        0          0
14          0        0          0   ||  30          0        0          0
15          0        0          0   ||  31          0        0          0
16          0        0          0   ||  32          0        0          0

M8850_SF.8.PXM.a >
```

On PXM1E and PXM45 platforms, the output of the PXM **dspliccd** <*slot*> command also shows if a card is in slot license alarm, and displays how much time is left in the alarm *grace period* and if provisioning is allowed with the **addcon** command. The following example shows the output of the PXM **dspliccd** <*slot*> command of an MPSM-8T1-FRM card in a PXM45 platform in the slot license alarm state:

```
M8850_SF.8.PXM.a > dspliccd 28
M8850_SF                         System Rev: 05.00   Jul. 10, 2004 05:02:24 GMT
MGX8850                                              Node Alarm: MINOR
```

```
Card License Alarm:             Minor
Service Module Type:            MPSM-8T1-FRM
Service Module Serial Number:   SAG07208RRA
Provisioning Allowed:           Yes
Grace-Period Remaining:         4 Days, 22 Hrs

=========================================================
Allocated License Type      Quantity
--------------------        --------
RateControl                 1

=========================================================
Programmed License Type     Quantity
--------------------        --------
RateControl                 1

=========================================================
Programmed License Registered:           Yes
License Registeration Node:              M8850_SF
License Registeration Chassis Serial No: SCA062300GF

M8850_SF.8.PXM.a >
```

On PXM1E and PXM45 platforms, the **dspcd** command will indicate if a card is in slot license alarm. If the card is in the slot license alarm state, the *cardIntegratedAlarm* will be *minor* and the *cardMinorAlarmBitMap* will indicate *License Alarm*. The following example shows the output of the **dspcd** command of an MPSM-8T1-FRM card in a PXM45 platform in the slot license alarm state:

```
M8850_SF.1.28.MPSM8T1.FRM.a > dspcd

  ModuleSlotNumber:           28
  FunctionModuleState:        Active
  FunctionModuleType:         MPSM-8T1-FRM
  FunctionModuleSerialNum:    SAG07208RRA
  FunctionModuleHWRev:        02
  FunctionModuleFWRev:        030.000.004.016-P2
  FunctionModuleResetReason: Reset by PXM
  LineModuleType:             LM-RJ48-8T1
  LineModuleState:            Present
  mibVersionNumber:           102
  configChangeTypeBitMap:     No changes
  cardIntegratedAlarm:        Minor
  cardMinorAlarmBitMap:       LICENSE ALARM

      Front Card Info

  PCB PART NO-(800 LEVEL):    800-22480-04
  PCB PART_NO-(73 LEVEL):     73-8466-04
  PCB REVISION (800 LEVEL):
  PCB SERIAL NO:              SAG07208RRA
  CLEI CODE:                  0
  MANUFACTURING ENG:          0x0
  RMA TEST HISTORY:           0x0

      Back Card Info

  PCB PART NO-(800 LEVEL):    000-00000-00
  PCB PART NO-(73 LEVEL):     00-00000-00
  PCB REVISION (800 LEVEL):  AA
  FAB PART NO-(28 LEVEL):     28-02011-01
  PCB SERIAL NO:              648467
  MANUFACTURING ENG:          0x1C
  RMA HISTORY:                0x0
```

```
M8850_SF.1.28.MPSM8T1.FRM.a >
```

On PXM1E and PXM45 platforms, the output of the MPSM **dspliccd** command also shows if a card is in slot license alarm. The following example shows the output of the **dspliccd** command of an MPSM-8T1-FRM card in a PXM45 platform in the slot license alarm state:

```
M8850_SF.1.28.MPSM8T1.FRM.a > dspliccd
Card License Alarm:              Minor
Service Module Type:             MPSM8T1E1
Service Module Serial Number:    SAG07208RRA
Provisioning (addcon) Allowed:   YES
=========================================================
Needed License Type               Needed Licenses
-------------------               ---------------
RateControl                       1

=========================================================
Allocated License Type            Allocated licenses
----------------------            ------------------
RateControl                       1

=========================================================
Programmed  License Type          Programmed licenses
------------------------          -------------------
RateControl                       1

=========================================================
Programmed License Registered:   YES
License registration node:       M8850_SF

Type <CR> to continue, Q<CR> to stop:
License registration chassis:    SCA062300GF
=========================================================

M8850_SF.1.28.MPSM8T1.FRM.a >
```

Note If the switch is in node license alarm, you must rekey the PXM license pool *before* proceeding with any other license management tasks. (See “Rekeying Feature Licenses” section on page F-21.)

When the switch is in slot license alarm, you have a grace period of 5 days (120 hours) to resolve the alarm(s). During the first 4 days (96 hours), traps are sent every 24 hours. For the final 24 hours of the grace period, traps are sent every hour of operation. If the alarms do not get cleared, the following actions are taken:

- An event is logged indicating the expiration of the grace period for a given slot needing license(s).
- A trap is sent hourly indicating the expiration of the grace period.
- The **addcon** command is blocked on the slot in license alarm until the license alarms are cleared.

When the PXM license pool has been rekeyed or licenses have been added to the PXM license pool, provisioning is restored and the switch exits the license alarm state.

Rekeying Feature Licenses

Use this procedure to get your node out of the *Node License Alarm* state.

A *rekey license* can be obtained by contacting Cisco TAC. The rekey license is delivered in the form of an encrypted key, which appears within an E-mail message or within a text file attached to an E-mail. To get a rekey license, provide TAC with the output generated by the **dsplicnodeid** command for the switch that needs to be rekeyed. The general procedure is as follows:

1. Collect the output generated by the **dsplicnodeid** command for the destination switch.
2. Contact Cisco TAC, provide the output generated by the **dsplicnodeid** command from the previous step, and obtain a rekey license.
3. Apply the rekey license to the destination switch.

The following procedure describes how to obtain and install a rekey license:

Step 1 Log in to the node.

Step 2 To display the node ID used for licensing, enter the **dsplicnodeid** command as follows:

```
M8850_SF.8.PXM.a > dsplicnodeid

NodeID=SCA062300GF:000006:005:000:004
```

To generate a rekey license, contact Cisco TAC and provide the output collected in Step 2. After you arrange for the rekey license, you will receive an encrypted key in an E-mail message and in an attached license file.

- If you plan to apply the rekey license using the encrypted key sent in the E-mail message, go to Step 3.
- If you plan to apply the rekey license on the destination switch using the license file, FTP the license file to the C:/LICENSE directory on the destination switch. Then go to Step 4.

Step 3 To apply the rekey license using the encrypted key, copy the encrypted key from the E-mail. Enter the **cnflic** command using the following syntax, then **skip to Step 5**:

```
M8850_SF.7.PXM.a > cnflic licenseString
```

Replace *licenseString* with the encrypted key supplied in the E-mail message as shown in the following example:

```
M8850_SF.8.PXM.a > cnflic
01050004e435730660768401f6608ec42404477f35d311f226fb3bd2992a92359da94c979d7ed2bff3d24c4630
25c1
Update method          :Rekey
Card type              :----
Creation date/time     :TUE JUL 06 21:02:43 2004
Grace period (days)    :0
Update sequence number:7
Licence serial number :L0000000502
Num of features        :0
---------------      -----
License Type         Qty
---------------      -----

Please confirm the above licence information.
cnflic:Do you want to proceed (Yes/No)? y

M8850_SF.8.PXM.a >
```

Step 4 To apply the rekey license using the license file, enter the **cnflic** command using the following syntax:

```
M8850_SF.7.PXM.a > cnflic -f filename
```

Replace *filename* with the name of the license file as shown in the following example:

```
M8850_SF.8.PXM.a > cnflic -f L_20040706140923521.dat
Update method          :Rekey
Card type              :----
Creation date/time     :TUE JUL 06 21:09:23 2004
Grace period (days)    :0
Update sequence number:8
Licence serial number :L0000003455
Num of features        :0
---------------      -----
License Type         Qty
---------------      -----

Please confirm the above licence information.
cnflic:Do you want to proceed (Yes/No)? y

M8850_SF.8.PXM.a >
```

Step 5 To verify that the feature licenses have been rekeyed, enter the **dspndalms** command as follows:

```
M8850_SF.8.PXM.a > dspndalms
Node Alarm Summary

Alarm Type                     Critical       Major          Minor
----------                     --------      -------        -------
Clock Alarms                         0              0              0
Switching Alarms                     0              0              0
Environment Alarms                   0              0              0
Card Alarms                          0              0              0
Node License Alarm                   0              0              0

M8850_SF.8.PXM.a >
```

In this example, after applying the rekey license to the destination switch, the switch is now out of the *Node License Alarm* state.

Step 6 Enter the **saveallcnf** command.

Caution To avoid losing licenses during a configuration restoration, we recommend you save the switch configuration after applying the rekey license by using the **saveallcnf** command.

APPENDIX G

Reliability, Availability, and Serviceability

Both the PXM45 and the PXM1E support the following reliability, availability, and serviceability (RAS) features:

- Power On Self Test (POST)
- Hardware Monitoring Module (HMM)
- Online diagnostics
- Offline diagnostics
- Enhanced alarm reporting

The POST and HMM features are transparent to the user. However, the **dsppostresults** command can be used to display the POST results. POSTs are a set of tests that run at boot-up time. POSTS cannot be disabled.

Diagnostics

Diagnostics commands can be used to isolate or troubleshoot problems. The following procedure shows the steps for identifying problems or failures:

Step 1 Observe card alarms.

MGX8850.7.PXM.a>**dspndalms**

Step 2 Observe hardware or diagnostic alarms and slot numbers

MGX8850.7.PXM.a>**dspcdalms**

Step 3 If there are hardware alarms, change card to appropriate slot .

MGX8850.7.PXM.a>**cc** *slot*

Step 4 Display alarms to identify the device.

MGX8850.7.PXM.a>**dsphwalms**

Step 5 Display errors on device.

MGX8850.7.PXM.a>**dspdeverr** ***device***

Step 6 If there are diagnostic alarms, change card to appropriate slot

MGX8850.7.PXM.a>**cc** *slot*

Step 7 Display diagnostics results.

MGX8850.7.PXM.a>**dspdiagresults**

Table G-1 shows some of the other commands that can be used to isolate and troubleshoot problems. For details about these commands refer to the *Cisco MGX 8850 (PXM45/PXM1E), Cisco MGX 8950, Cisco MGX 8830, and Cisco MGX 8880 Command Reference, Release 5*.

Table G-1 RAS-Related Diagnostics, Alarm, and POST Commands

Command	Description
cnfdiag	Configures (enables/disables) online diagnostics and schedules offline diagnostics for a specific slot.
cnfdiagall	Configures (enables/disables) online diagnostics and schedules offline diagnostics for all slots.
dspdiagcnf	Displays the configuration of online and offline diagnostics
dspdiagstatus	Displays the status of online and offline diagnostics on all slots and indicates whether diagnostics is ready to be enabled or not.
dspdiagstat	Displays the statistics of online and offline diagnostics execution for a specific slot.
dspdiagerr	Displays errors of online and offline diagnostics execution on all slots.
dspdiagtests	Displays a list of all diagnostics tests.
clrdiagstat	Clears the statistics of executed online and offline diagnostics for a specific slot.
clrdiagerr	Clears the errors reported by online and offline diagnostics for a specific slot.
dspdeverr	Displays the error types and error counts for a specific device in a slot.
abortofflinediag	Stops the currently running offline diagnostics test.
dspdeverrhist	Displays the history of error types and error counts for a specific device in a slot.
dspdiagresults	Displays the diagnostics test results and alarm conditions for a specific slot.
dsphwalms	Displays a summary of errors and alarms for all devices in a slot.
dsppostresults	Displays the Power on Self Test (POST) results.

Diagnostics Examples

The following example shows the display output for the **dspdiagresults** command:

```
MGX8850.7.PXM.a>  dspdiagresults

       --------------------------------------------------------
                Online Diagnostics Test Summary
       --------------------------------------------------------
 Id    Name                 En     #Att  #Fail  #Pass  Alarm  Result
 --    ----                 --     ----  -----  -----  -----  -----
  1    Data Path            Y      2868     0    2868   None  Pass
  2    Trap Freq Monitor    Y      1434     0    1434   None  Pass
  3    Memory Access        Y      2868     0    2868   None  Pass
  4    Atlas Reg Access     Y      2868     0    2868   None  Pass
  5    Atlas Sram Access    Y      2868     0    2868   None  Pass
  6    Framer/LIU Access    Y      2868     0    2868   None  Pass
  7    Elmer Access         Y      2868     0    2868   None  Pass
  8    Flash CheckSum       Y      2868     0    2868   None  Pass
  9    Ethernet Ping        Y      2868     0    2868   None  Pass
 10    QE RAM Access        Y      2868     0    2868   None  Pass
```

```
 11    HDsk PCI Access      Y      2868     0    2868   None  Pass
 12    HDsk Rd/Wr           Y        95     0      95   None  Pass
 13    CBC RAM Access       Y      2868     0    2868   None  Pass
 14    BRAM checksum        Y      2868     0    2868   None  Pass
 15    Control Path         Y      28680    0   28680   None  Pass
```

The following example shows the display output for the **dsppostresults** command:

```
MGX8850.7.PXM.a> dsppostresults

--------------------------------------------------------
          Power On Self Test Results
--------------------------------------------------------
Test Name            Result      Description
---------------      ---------   ---------------
BRAM Checksum        PASS
QE RAM               PASS
CBC RAM              PASS
Ethernet Reg         NOT DONE    Test Not Required
PCI-IDE Reg          PASS
Clock Mux            PASS
Framer 1 Access      PASS
Framer 2 Access      PASS
Framer 3 Access      PASS
Framer 4 Access      PASS
ATLAS 1 RAM          PASS
Hard Disk Access     PASS
```

The following example shows the display output for the **dsphwalms** command:

```
MGX8850.7.PXM.a>dsphwalms

   Device       Alarms
   -------      ------
   DISK None
   ATLAS (1)    None
   ATLAS (0)    None
   NILE4        None
   CBC (0)      None
   CBC (1)      None
   QE1210 (1)   None
   QE1210 (0)   None

 Use dspdeverr <device> to see more detail.
```

The following example shows the display output for the **dspdeverr** command:

```
MGX8850.7.PXM.a>dspdeverr QE1210

PXM                 System Rev: 04.00   Dec. 19, 1999 07:32:33 GMT
MGX8850              Node Alarm: CRITICAL

 CURRENT ERROR COUNT FOR DEVICE QE1210 (1)  (Alarm :  None)
 -------------- ---------  ---------- ------ ----------- -------------

   Error Type         Total Errors
   --------------     -----   ------
   Rx HW Err          0
   DTE ProcErr        0
   RAM ERR            0


 CURRENT ERROR COUNT FOR DEVICE QE1210  (0)   (Alarm :  None)
 ------------- ---------- ---------- -----  ------------ ------------
```

```
   Error Type      Total Errors
   -------------   -------- -------
   Rx HW Err       0
   DTE ProcErr     0
   RAM ERR         0
```

The following example shows the display output for the **dspdeverrhist** command:

```
MGX8850.7.PXM.a>dspdeverrhist QE1210
PXM               System Rev: 04.00   Dec. 19, 1999 07:32:33 GMT
MGX8850            Node Alarm: CRITICAL

 HISTORY ERROR COUNT FOR DEVICE QE1210  (1)
 ------------   ----- ----- --- ------ --------------

   Error Type      Total Errors
   -------------   ------- ------
   Rx HW Err       0
   DTE ProcErr     0
   RAM ERR         0


 HISTORY ERROR COUNT FOR DEVICE QE1210  (0)
 ------- ----- ----- --- ------ ----------------------------------------

   Error Type       Total Errors
   ---------------  ------- ------
   Rx HW Err        0
   DTE ProcErr      0
   RAM ERR          0

MGX8850.8.PXM.a > dspdiagtests
-------------------------------------------
        Online Diagnostic Tests
 Id TestName
 -- --------
 1 Utopia Test
 2 Path Test
 3 Xbar Test
 4 Trap Freq Monitor
 5 Memory Access
 6 Elmer Access
 7 Flash Checksum
 8 Ethernet Ping
 9 QE RAM Access
10 HDD PCI Access
11 HDD R/W
12 CBC RAM Access
13 BRAM Checksum

MGX8850.8.PXM.a >
```

Diagnostics Tests

This section lists the diagnostics tests for the PXM1E and PXM45.

PXM1E Diagnostics Tests

The following tests are valid on the PXM1E.

PXM1E Power On Self-Tests (POST)

- BRAM checksum
- QE RAM
- CBC RAM
- Ethernet Register Access
- PCI/IDE Register Access
- Clock Mux Validation
- Framer Access
- Atlas1 RAM Access
- Atlas2 RAM Access
- Hard Disk Access

PXM1E Path tests

- Data Path
- Control Path

PXM1E Device Tests

- Atlas Register Access
- Atlas SRAM Access
- Framer/LIU Access
- Trap Frequency Monitor
- Elmer Access
- Flash Checksum
- Ethernet Ping
- QE RAM Access
- HDD PCI Access
- HDD R/W
- CBC RAM Access
- BRAM checksum
- Memory Access

PXM45 Diagnostics Tests

The following tests are valid on the PXM45.

PXM45 Power On Self-Tests (POST)

- BRAM Checksum
- QE RAM
- CBC RAM
- Ethernet Register

- PCI/IDE Register Access
- Clock Mux Validation
- Hard Disk Access

PXM45 Path Tests

- Utopia Loopback
- Path Test
- Crossbar test
- Device Tests
- QE RAM Access
- CBC RAM Access
- Flash Checksum
- HDD R/W
- HDD PCI Access
- Trap Frequency Monitor
- Ethernet Ping
- BRAM checksum
- Memory Access

Symbols

A

B

D

E

L

M

N

Q

R

S

T

U

V